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PART I

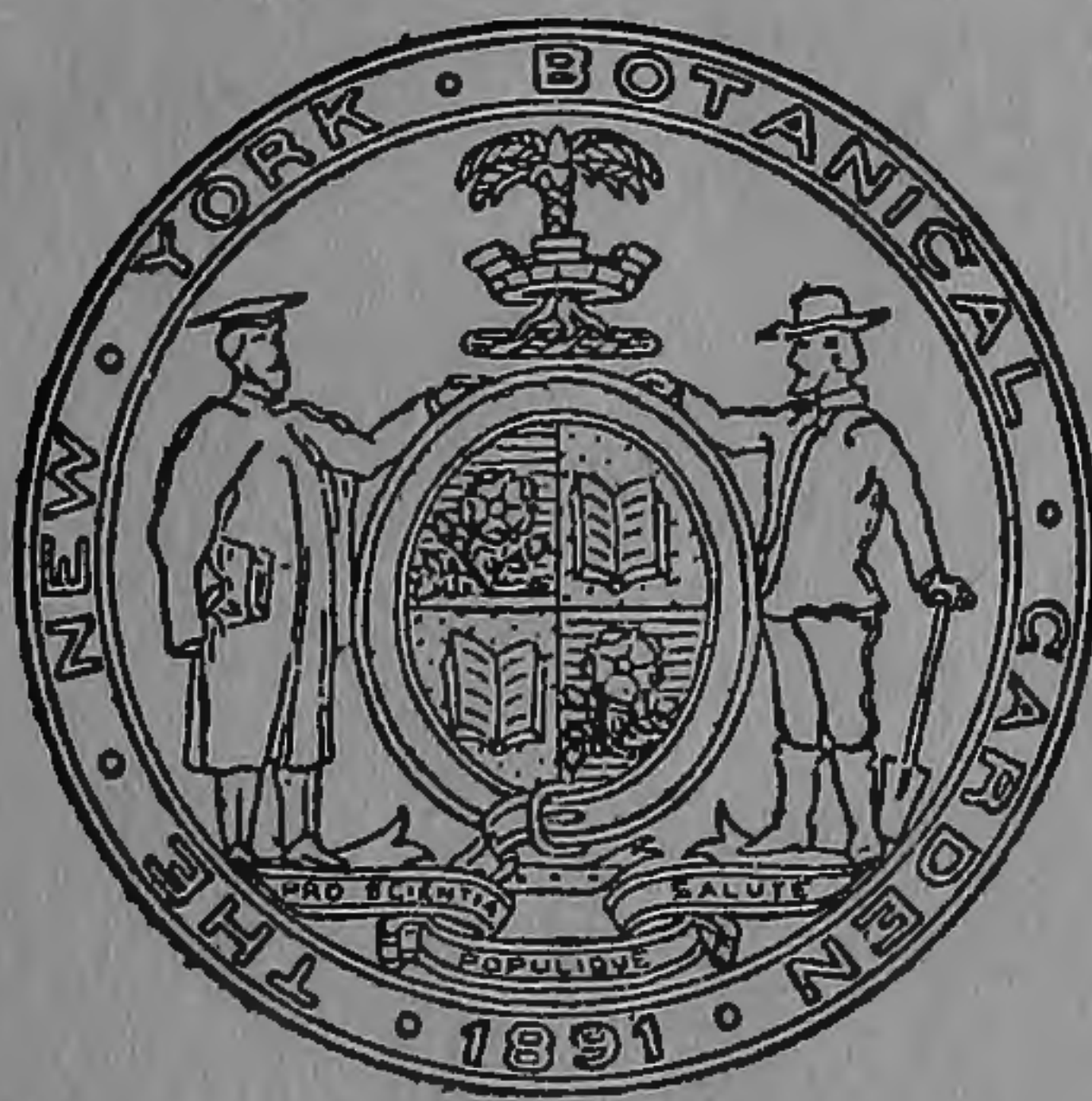
# NORTH AMERICAN FLORA

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USTILAGINALES

USTILAGINACEAE, TILLETIACEAE

GEORGE PERKINS CLINTON



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## ANNOUNCEMENT

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The NORTH AMERICAN FLORA is designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago, and Curaçao and other islands off the north coast of Venezuela, whose flora is essentially South American.

The work will be published in parts at irregular intervals, by the New York Botanical Garden, through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence :

Volume 1. Mycetozoa, Schizophyta, Diatomaceae.

Volumes 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 30. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Professors L. M. Underwood and N. L. Britton.

Professor George F. Atkinson, of Cornell University ; Professors Charles R. Barnes and John M. Coulter, of the University of Chicago ; Mr. Frederick V. Coville, of the United States Department of Agriculture ; Professor Edward L. Greene, of the United States National Museum ; Professor Byron D. Halsted, of Rutgers College ; and Professor William Trelease, of the Missouri Botanical Garden, have consented to act as an advisory committee.

Each author will be wholly responsible for his own contributions, being restricted only by the general style adopted for the work, which must vary somewhat in the treatment of diverse groups.

The subscription price is fixed at \$1.50 for each part ; it is expected that four or five parts will be required for each volume. A limited number of separate parts will be sold at \$2.00 each. Address :

THE NEW YORK BOTANICAL GARDEN

BRONX PARK

NEW YORK CITY

## Order USTILAGINALES<sup>1</sup>

BY GEORGE PERKINS CLINTON

Parasitic fungi infesting various parts of herbaceous flowering plants. Infection through the very young tissues of any part of the host or more frequently limited to special portions, often only through the germinating seed. Mycelium local or widespread, consisting of hyaline, somewhat septate, branched filaments practically limited to the interior of the host; at maturity often disappearing partially or wholly through gelatinization; fertile mycelium compacting into masses and giving rise, in various ways, to chlamydospores formed from their internal contents; rarely developing a conidial stage on the exterior of the host. Sori evident, usually forming dusty or agglutinated spore-masses that break out in definite places on the host; more rarely permanently embedded in the tissues. Spores (chlamydospores) light- to dark-colored, 4–35  $\mu$  in diameter, single, in pairs, or in spore-balls, the latter often composed in part of sterile cells. Germination by means of a promycelium, usually producing terminal or lateral sporidia which may be capable of a saprophytic existence in nature and which often reproduce themselves abundantly through a yeast-like process of budding.

Promycelium usually with lateral sporidia at septa.  
Promycelium with clustered terminal sporidia.

Fam. 1. USTILAGINACEAE.  
Fam. 2. TILLETIACEAE.

<sup>1</sup> This paper is based on the writer's monograph of North American Ustilagineae (Proc. Bost. Soc. Nat. Hist. 31 : 329–529) published in October, 1904. In the present paper there are omitted the general notes, notes under genera and species, most of the older European synonyms, the list of species showing general distribution, and the bibliography. There are added to the paper such further species, hosts, and distributions as have since come to hand. The following are the additional species and varieties described here: *Entyloma Holwayi* Sydow, *Sphacelotheca diplospora glabra* Clinton & Ricker, var. nov., *Sphacelotheca diplospora verruculosa* Clinton, var. nov., *Tilletia Eragrostidis* Clinton & Ricker, *Tilletia Muhlenbergiae* Clinton, sp. nov., *Tilletia Redfieldiae* Clinton, sp. nov., *Tolyposporium globuligerum* (Berk. & Br.) Ricker, *Urocystis Lithophragmae* Garrett, sp. nov., *Ustilago Kellermanii* Clinton, sp. nov., *Ustilago punctata* Clinton, sp. nov., *Ustilago Rickerii* Clinton, sp. nov., *Ustilago Sieglinae* Ricker. *Ustilago Panici-leucophaei* Bref. has been placed under the genus *Sphacelotheca*. Under each species have also been added references to the type locality (including host) and to illustrations of the species. The names of the hosts have been made to conform in general with the nomenclature to be used in the Flora. Under each species, however, the writer has indicated in parentheses the former name when there has been a change. Finally there have been added under the genera artificial keys to aid in the identification of the species.





## Family 1. USTILAGINACEAE

BY GEORGE PERKINS CLINTON

Sori usually forming exposed dusty or agglutinated spore-masses. Germination by means of a septate promycelium which gives rise to terminal and lateral sporidia (capable of yeast-like multiplication in nutrient solutions) or else to infection-threads.

Spores single.

Sori dusty at maturity.

Without definite false membrane.

With false membrane of definite fungous cells.

Sori agglutinated at maturity.

Firmly agglutinated into conspicuous tubercular nodules.

Developed around a central columella (rarely dusty).

Spores chiefly in pairs.

Sori agglutinated (on leaves).

Sori dusty (inside peduncles).

Spores in balls.

Sori dusty or granular.

Spore-balls often evanescent; spores olive-brown or black-brown.

Spore-balls rather permanent; spores yellowish or reddish, with markings only on free surface.

Spore-balls quite permanent; spores adhering by folds or thickenings of outer coat.

Sori agglutinated.

Spore-balls (variable) composed of thick-walled spores.

Spore-balls with peripheral spores and central sterile cells.

1. USTILAGO.

2. SPHACELOTHECA.

3. MELANOPSICHIMUM.

4. CINTRACTIA.

5. SCHIZONELLA.

6. MYKOSYRINX.

7. SOROSPORIUM.

8. THECAPHORA.

10. TOLYPOSPORIUM.

9. TOLYPOSPORELLA.

11. TESTICULARIA.

### 1. USTILAGO (Pers.) Roussel,<sup>1</sup> Fl. Calvados ed. 2. 47. 1806.

*Necrosis* Paulet, Traité Champ. 1: 548; hyponym. 1793.

*Uredo* § *Ustilago* Pers. Syn. Fung. 224. 1801.

*Ustilagidium* Herzb. in Zopf, Beitr. Phys. Morph. Org. 5: 7. 1895.

Sori on various parts of the hosts, at maturity forming dusty, usually dark-colored spore-masses; spores single, produced irregularly in the fertile mycelial threads which early entirely disappear through gelatinization, small to medium in size; germination by means of a septate promycelium producing only infection-threads or with sporidia formed terminally and laterally near the septa; sporidia in water usually germinating into infection-threads but in nutrient solutions multiplying indefinitely, yeast fashion.

Type, *Uredo segetum* Pers.

#### A. Spores reddish-, olive-, or black-brown.

1. Spores perfectly smooth (see also nos. 3, 19, 25, 33).

Spores small, 4-10  $\mu$  in length.

Sori around the internodes.

Sori with false membrane of fungous threads.

Sori without evident false membrane.

Sori involving entire inflorescence.

Sori in individual spikelets.

Spores lighter-colored on one side.

Sori small, about 1 mm. in length.

Sori 6-10 mm. in length.

Hosts: *Avena*; spore-mass brown-black.

Hosts: *Hordeum*; spore-mass purple-black.

1. *U. minima*.

2. *U. hypodytes*.

20. *U. Panici-prolifera*.

5. *U. mexicana*.

7. *U. levis*.

6. *U. Hordei*.

<sup>1</sup>J. Bauhin, Hist. Pl. 2: 418, in 1651, is really the founder of *Ustilago*. Fries or Persoon is ordinarily cited as the authority for the genus. Fries used *Ustilago* as a genus in his Syst. Myc. 3: 517, in 1832, with *U. grandis* as the first species. Persoon used *Ustilago* as a subgenus under *Uredo* with *Uredo segetum* as the first species, having five varieties of which a *U. Hordei* is first, and this may be taken as the actual type now that *U. segetum* has been broken up into several species. Roussel merely adopted *Ustilago* from Persoon, but raised it to full generic rank, giving three of Persoon's four species, of which *U. segetum* is one. Paulet's name, *Necrosis*, cannot be regarded as a true generic name, but was used more as a descriptive term.

- Spores uniformly colored.  
 Sori completely destroying spikelets.  
 Sori usually destroying inner and basal parts.  
 Sori in leaf-sheaths or blades; spores 8–11  $\mu$ .  
 Spores medium, 10–14  $\mu$  in length; sori in ovaries.  
 Spores large, 13–22  $\mu$  in length, the inner coat with projections.
2. Spores often apparently smooth but at least granular under an immersion lens.  
 Sori in leaves; spores scarcely granular.  
 Sori in inflorescence, sometimes confined to spikelets.  
 Sori in spikelets.  
 Sori rather completely destroying spikelets.  
 Sori destroying only basal and inner parts.  
 Sori in ovaries; spores apparently smooth.  
 Sori in flowers protected by perianth.
3. Spores echinulate or verruculose (occasionally minutely or obscurely).  
 Spores small, 4–9  $\mu$  in length.  
 Sori in leaves.  
 Sori in striae or areas of considerable extent.  
 Sori pustular.  
 Sori involving or aborting inflorescence.  
 Sori ovoid to subspherical; spores 4–6  $\mu$ .  
 Sori linear; spores 6–11  $\mu$  in length.  
 Sori in spikelets.  
 Sori rather completely destroying spikelets.  
 Hosts: *Avena*.  
 Hosts: *Triticum*.  
 Hosts: *Hordeum*.  
 Sori destroying inner and basal parts.  
 Sori in ovaries.  
 Spores evidently echinulate or verruculose.  
 Spores variable, often elongated, olive-brown.  
 Spores rather regular, reddish-brown.  
 Spores obscurely echinulate, often appearing smooth.  
 Spores uniformly colored, 4–6  $\mu$  in length.  
 Spores often lighter colored on one side, 5–9  $\mu$ .  
 Spores medium, 9–14  $\mu$  in length (see also nos. 21, 47).  
 Sori on various parts of host.  
 Sori at nodes and on leaves, nodular, hispid.  
 Sori in ovaries, nodes, etc., pustular, smooth.  
 Sori usually at nodes, conspicuous, ovate to lanceolate.  
 Sori on any part of host, usually very conspicuous.  
 Sori forming elongate outbreaks, aborting inflorescence.  
 Sori in leaves.  
 Sori in striae.  
 Sori involving leaves at apex of culm and aborting inflorescence.  
 Sori linear, very elongate, often 1 dm.  
 Sori elongate-ellipsoidal, 5–10 mm.  
 Sori in inflorescence (see also nos. 39, 48, 52).  
 Hosts: *Syntherisma* (*Panicum*).  
 Hosts: *Chloris*.  
 Sori in spikelets, infecting entire spike.  
 Sori in ovaries (see also no. 34).  
 Sori conspicuous, chiefly 3–6 mm., hispid.  
 Sori rather inconspicuous, 1–4 mm. in length.  
 Spores echinulate.  
 Hosts: *Eragrostis*.  
 Hosts: *Bouteloua*.  
 Hosts: *Tridens* (*Tricuspis*).  
 Spores minutely and obscurely verruculose.  
 Spores very conspicuously echinulate.  
 Spores with coarse, often acute tubercles.  
 Sori very inconspicuous, 1 mm. or less.  
 Spores large, 14–18  $\mu$ , rarely 12  $\mu$ , in length.  
 Sori in leaves.  
 Sori forming oblong pustules.  
 Spores smooth or obscurely verruculose.  
 Spores echinulate.  
 Sori forming linear striae; spores verrucose.  
 Sori in inflorescence.  
 Spores light reddish-brown, minutely echinulate.  
 Spores prominently echinulate; sorus with columella.  
 Spores dark reddish-brown, verruculose.  
 Hosts: *Sporobolus*.  
 Hosts: *Festuca*.
4. Spores coarsely verrucose to occasionally semi-reticulate.  
 Sori on leaves.  
 Hosts: *Agropyron*, *Elymus*, etc.  
 Hosts: *Phalaris*.  
 Hosts: *Panicularia* (*Glyceria*), *Scolochloa*.
14. *U. affinis*.  
 17. *U. Crameri*.  
 4. *U. calcara*.  
 18. *U. lycuroides*.  
 58. *U. Heufleri*.  
 3. *U. longissima*.  
 13. *U. residua*.  
 15. *U. Lorentziana*.  
 16. *U. bromivora*.  
 19. *U. Rickerii*.  
 23. *U. Tillandsiae*.  
 21. *U. Ulei*.  
 31. *U. minor*.  
 12. *U. Muhlenbergiae*.  
 22. *U. chloridicola*.  
 9. *U. Avenae*.  
 11. *U. Tritici*.  
 10. *U. nuda*.  
 8. *U. perennans*.  
 24. *U. olivacea*.  
 27. *U. sparsa*.  
 25. *U. Sieglingiae*.  
 26. *U. Triplasidis*.  
 36. *U. Crus-galli*.  
 34. *U. pustulata*.  
 37. *U. heterogena*.  
 38. *U. Zeae*.  
 39. *U. Kellermanii*.  
 53. *U. striaeformis*.  
 52. *U. Dieteliana*.  
 48. *U. Aegopogonis*.  
 46. *U. Rabenhorstiana*.  
 51. *U. elegans*.  
 40. *U. neglecta*.  
 35. *U. sphaerogena*.  
 28. *U. spermophora*.  
 29. *U. Boutelouae*.  
 30. *U. Tricuspidis*.  
 41. *U. Uniolae*.  
 43. *U. ornata*.  
 44. *U. Sporoboli*.  
 42. *U. Eriocauli*.  
 33. *U. Buchloes*.  
 32. *U. Hieronymi*.  
 54. *U. Calamagrostidis*.  
 49. *U. Hilariae*.  
 47. *U. Holwayana*.  
 45. *U. Vilfae*.  
 50. *U. Mulfordiana*.  
 55. *U. macrospora*.  
 56. *U. echinata*.  
 57. *U. Arthuri*.



## B. Spores yellow or golden-brown.

Spores smooth or obscurely echinulate, 7–12  $\mu$  in length.  
 Spores coarsely verrucose, 13–20  $\mu$  in length.

59. *U. Vaillantii*.  
 60. *U. Oxalidis*.

## C. Spores violet or purplish.

Spores very minutely and obliquely striate.

Hosts: *Macounastrum* (*Koenigia*).

Hosts: *Polygonum*.

Spores minutely verruculose.

Spores though appearing smooth very minutely pitted-reticulate.

Spores with winged reticulations.

Sori in stems, petioles and midribs.

Sori in inflorescence and floral axis.

Sori in flowers or their organs.

Sori in ovaries and often stamens, inclosed by floral envelopes.

Spores small, 7–10  $\mu$ , minutely reticulate (1  $\mu$ ).

Spores medium, 10–14  $\mu$  in length.

Spores light-violet, rather finely reticulate (1–3  $\mu$ ).

Spores purplish; reticulations coarser (2–4  $\mu$ ).

Spores medium large, 14–17  $\mu$ ; reticulations 1.5–2  $\mu$ .

Sori in anthers.

Sori in seeds; spores 12–18  $\mu$ ; reticulations about 1  $\mu$ .

69. *U. Koenigiae*.  
 70. *U. Piperii*.  
 72. *U. Bistortiarum*.  
 71. *U. punctata*.  
 68. *U. Parlatoresii*.  
 67. *U. Rumicis*.  
 61. *U. vinosa*.  
 65. *U. anomala*.  
 66. *U. utriculosa*.  
 64. *U. Calandriniae*.  
 62. *U. violacea*.  
 63. *U. Gayophyti*.

1. *Ustilago minima* Arth. Bull. Iowa Agr. Coll. Dep.

Bot. 1884: 172. 1884.

Sori on stems, linear, usually 3–5 cm. in length, with a conspicuous whitish false membrane composed chiefly of elongated sterile fungous threads, upon rupture disclosing a dusty black-brown spore-mass surrounding stem as columella; spores light reddish-brown, chiefly ovoid to subspherical or spherical, smooth, 3.5–4.5  $\mu$ , or elongate, 5.5  $\mu$ , in length.

## ON POACEAE:

*Eriocoma cuspidata* (*Oryzopsis cuspidata*), Arizona.

*Stipa spartea*, Iowa, South Dakota.

TYPE LOCALITY: Ames, Iowa, on *Stipa spartea*.

DISTRIBUTION: Iowa, South Dakota and Arizona.

EXSICCATI: Selys. & Earle, Econ. Fungi C 70; Griff. West Am. Fungi 237.

2. *Ustilago hypodytes* (Schlecht.) Fries, Syst. Myc. 3: 518. 1832.

*Caeoma hypodytes* Schlecht. Fl. Berol. 2: 129. 1824.

*Ustilago Sporoboli* Ellis & Ev. Bull. Torrey Club 24: 282. 1897. (Type from Colorado, on *Sporobolus cryptandrus*.) Not *U. Sporoboli* Tracy & Earle, 1896.

*Ustilago funalis* Ellis & Ev. Bull. Torrey Club 24: 457. 1897.

*Sorosporium Williamsii* Griff. Bull. Torrey Club 29: 296. 1902. (Type from Wyoming, on *Stipa Richardsonii*.)

Sori surrounding internodes (beginning at their bases) for usually the greater part of their length, linear, hidden by enveloping leaf-sheaths but without special covering membrane, when mature forming a dusty dark-brown spore-mass; spores ovoid to spherical, occasionally slightly polyhedral or irregular, smooth, often guttulate, chiefly 4–7  $\mu$  in length.

## ON POACEAE:

*Agropyron occidentale*, Montana, South Dakota.

*Distichlis spicata* (*D. maritima*), Arizona, California, Connecticut, Nevada, New Mexico, Oregon, Texas, Washington.

*Elymus canadensis*, Iowa.

*Elymus condensatus*, California, Nevada, Oregon, Washington.

*Elymus glaucus*, California.

*Elymus striatus*, Montana.

*Eriocoma cuspidata* (*Oryzopsis cuspidata*), Colorado.

*Poa Buckleyana*, Nevada.

*Puccinellia airoides*, California.

*Sitanion longifolium*, California, Washington.

*Sporobolus cryptandrus*, Colorado.

*Sporobolus* sp., California.

*Stipa comata*, Montana, Nebraska, Washington.

*Stipa coronata*, California.

*Stipa eminens*, California.

*Stipa occidentalis*, Oregon.

*Stipa Richardsonii*, Wyoming.

*Stipa setigera*, California, Texas.

*Stipa spartea*, Illinois, South Dakota.

*Stipa Vaseyi*, New Mexico.

*Stipa viridula*, South Dakota.

*Stipa* sp., Utah, Washington.

TYPE LOCALITY: Vicinity of Berlin, Germany, on *Elymus arenarius*.

DISTRIBUTION: Connecticut; Illinois to Texas, California, and Washington; also in South America, Europe, Asia, and Africa.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: *pl. 3, f. 14*; Bull. Torrey Club 29: 291, *f. 5*; Bull. Iowa Agr. Exp. Sta. 54: *f. 114 (15), 117*; Rev. Myc. 12: *pl. 19, f. 275, 276*; Flora 83: *pl. 3, f. 7*; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: *pl. 3, f. 1*.

EXSICCATI: Griff. West Am. Fungi 3, 201, 233, 234, 235, 236, 306; Seym. & Earle, Econ. Fungi C 71; Ellis & Ev. N. Am. Fungi 3135; Ellis & Ev. Fungi Columb. 537, 1899; Sydow, Ust. 210.

### 3. *Ustilago longissima* (Sow.) Tul. Ann. Sci. Nat.

III. 7: 76. 1847.

*Lycoperdon filiforme* Schrank, Bot. Tasch. Hoppe 1793: 69. 1793. (Type from Bavaria, on *Poa aquatica*.)

*Uredo longissima* Sow. Engl. Fungi *pl. 139*. 1798.

*Ustilago filiformis* Rostr. Fests. Bot. For. Kjöb. 136. 1890.

Sori in leaves, forming more or less distinct and linear groups from a few mm. to length of the leaf, soon rupturing epidermal covering and the reddish-brown spore-mass becoming scattered from the more or less shredded tissues; spores light-brown, oblong or ellipsoidal to spherical, smooth or scarcely granular under an immersion, 4–8  $\mu$  in length.

ON POACEAE:

*Panicularia americana* (*Glyceria grandis*), Connecticut, Iowa, Massachusetts, Michigan, Minnesota, New York, Vermont, Wisconsin.

*Panicularia* (*Glyceria*) sp., New Hampshire.

TYPE LOCALITY: Lambeth Marsh, England, on *Poa aquatica* (*Panicularia aquatica*).

DISTRIBUTION: New England to Minnesota and Iowa; also in South America, Europe, and Asia.

ILLUSTRATIONS: Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 1*; Bull. Iowa Agr. Exp. Sta. 54: *f. 114 (17)*; Brefeld, Unters. Gesamt. Myk. 5: *pl. 8, pl. 9, f. 8–16*; Rev. Myc. 12: *pl. 19, f. 282–284*; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: *pl. 3, f. 2*; Plowright, Brit. Ured. Ust. *pl. 7, f. 14–16*.

EXSICCATI: Ellis & Ev. N. Am. Fungi 1096; Ellis & Ev. Fungi Columb. 469; Seym. & Earle, Econ. Fungi 541, C 73, C 74.

*Ustilago longissima macrospora* Davis, Trans. Wisc. Acad. 11: 174. 1897. Spores similar, somewhat more irregular and angled, apparently smooth but under an immersion minutely granular, 7–12  $\mu$  in length. ON POACEAE: *Panicularia fluitans* (*Glyceria fluitans*), Illinois, Maine, Wisconsin. *Panicularia laxa* (*G. laxa*), Maine. EXSICCATI: Ellis & Ev. N. Am. Fungi 3235; Seym. & Earle, Econ. Fungi 540, C 75; Sydow, Ust. 253.

### 4. *Ustilago calcara* Griff. Bull. Torrey Club 31: 85. 1904.

Sori in the leaf-sheaths, occasionally in the blades, extending between the veins and rupturing upon the exterior, circular, 0.5 mm. in diameter, or linear through confluence and then often 5 mm. or more in length; spores light to dark reddish-brown, irregular, ovate to subspherical, often pointed, with thin smooth walls, chiefly 8–11  $\mu$  in length.

ON POACEAE:

*Bouteloua breviseta*, New Mexico.

TYPE LOCALITY: Roswell, New Mexico, on *Bouteloua breviseta*.

DISTRIBUTION: New Mexico.

ILLUSTRATION: Bull. Torrey Club 31: 85, *f. 8*.

### 5. *Ustilago mexicana* Ellis & Ev. Jour. Myc. 3: 56. 1887.

Sori in the individual spikelets usually infecting all, ovate, small, about 1 mm. in length, more or less concealed by the enveloping glumes; spores reddish-brown, often lighter-colored on one side due in part to the thinner wall, ovoid to spherical or somewhat angular and irregular, smooth, 5.5–8  $\mu$  in length.

ON POACEAE:

*Muhlenbergia* sp., Mexico.

TYPE LOCALITY: Mountains near Batopilas, Mexico, on *Muhlenbergia* sp.

DISTRIBUTION: Mexico.

EXSICCATI: Ellis & Ev. N. Am. Fungi 1891.

### 6. *Ustilago Hordei* (Pers.) Kellerm. & Swingle, Ann. Rep. Kan.

Agr. Exp. Sta. 2: 268. 1890.

*Uredo segetum Hordei* Pers. Tent. Disp. Fung. 57. 1797.

*Ustilago Hordei lecta* Jens. Charb. Céréales 4. 1889.

*Ustilago Jensenii* Rostr. Overs. K. Danske Vid. Selsk. Forh. 1890: 12. 1890.

Sori in spikelets, forming an adhering purple-black spore-mass, about 6–10 mm. in length, covered rather permanently by the transparent basal parts of the glumes; spores



lighter-colored on one side, usually subspherical or spherical, smooth,  $5-9\mu$ , the most elongate rarely  $9-11\mu$ , in length.

ON POACEAE:

*Hordeum* spp. cult., California, Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Mississippi, Missouri, New Hampshire, New York, North Carolina, North Dakota, Ohio, Oregon, South Dakota, Vermont, Washington, Wisconsin; Canada; Nova Scotia; Mexico.

TYPE LOCALITY: Europe, on *Hordeum* sp. cult.

DISTRIBUTION: Coextensive with the cultivation of barley.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. E*; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 46*; Ann. Rep. Kan. Agr. Exp. Sta. 2: *pl. 2, f. 3-6, pl. 7*; Bull. Iowa Agr. Exp. Sta. 54: *f. 114* (12); Brefeld, Unters. Gesammt. Myk. 12: *pl. 7, f. 33-35*; Tubeuf, Diseases Pl. *f. 159*.

EXSICCATI: Seym. & Earle, Econ. Fungi 82<sup>b</sup>, C 69; Ellis & Ev. Fungi Columb. 1484; Kellerm. Ohio Fungi 40; Griff. West Am. Fungi 23, 23<sup>a</sup>; Ellis, N. Am. Fungi 1091.

7. *Ustilago levis* (Kellerm. & Swingle) Magn. Abh. Bot. Ver.

Prov. Brand. 37: 69. 1896.

*Ustilago Avenae levis* Kellerm. & Swingle, Ann. Rep. Kan. Agr. Exp. Sta. 2: 259. 1890.

? *Ustilago Kolleri* Wille, Bot. Notiser 1893: 10. 1893. (Type from Norway, on *Avena sativa*.)

Sori in spikelets, forming a black-brown adhering spore-mass, sometimes small and entirely concealed by the glumes but usually evident and destroying inner and basal parts; spores lighter-colored on one side, subspherical to spherical or rarely more elongate, smooth,  $5-9\mu$ , the most elongate rarely  $11\mu$ , in length.

ON POACEAE:

*Avena sativa*, Connecticut, Illinois, Iowa, Kansas, Maine, New Hampshire, North Carolina, Ohio, South Dakota, ~~Utah~~, Washington, West Virginia, Wisconsin; Nova Scotia.

TYPE LOCALITY: Kansas, on *Avena sativa*.

DISTRIBUTION: Nova Scotia to North Carolina, Utah, and Washington; also in Europe.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. A7, B, S3-4*; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 45*; Bull. Kan. Agr. Exp. Sta. 15: *pl. II*.

EXSICCATI: Griff. West Am. Fungi 27; Seym. & Earle, Econ. Fungi C 72; Ellis, Ev. & Barth. Fungi Columb. 1996; Ellis, N. Am. Fungi 1092, *p. p.*

8. *Ustilago perennans* Rostr. Overs. K. Danske Vid. Selsk.

Forh. 1890: 15. Mr 1890.

*Cintractia Avenae* Ellis & Tracy, Jour. Myc. 6: 77. S 1890. (Type from Mississippi, on *Arrhenatherum elatius*.)

Sori in spikelets, more or less destroying the basal and inner parts, sometimes even running down on pedicels, oblong, about 3-8 mm. in length, with dusty, olive-brown spore-mass; mycelium perennial in perennial parts of host; spores chiefly subspherical or spherical, occasionally ovate to ellipsoidal, usually lighter-colored on one side, more or less minutely echinulate especially on the lighter side,  $5-8\mu$  in length.

ON POACEAE:

*Arrhenatherum elatius* (*A. avenaceum*), Connecticut, Illinois, Indiana, Iowa, Mississippi, New York, Ohio, Vermont, Wisconsin.

TYPE LOCALITY: Europe, on *Avena elatior* (*Arrhenatherum elatius*).

DISTRIBUTION: New England to Iowa and Mississippi; also in Europe and Asia.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. C*; Bull. Iowa Agr. Exp. Sta. 54: *f. 119*; Brefeld, Unters. Gesammt. Myk. 12: *pl. 7, f. 25-28*; Tubeuf, Diseases Pl. *f. 157-158*.

EXSICCATI: Ellis & Ev. N. Am. Fungi 1893<sup>b</sup>, 2703; Seym. & Earle, Econ. Fungi 83, C 83.

9. *Ustilago Avenae* (Pers.) Jens. Charb. Céréales 4. 1889.

*Uredo segetum Avenae* Pers. Tent. Disp. Fung. 57. 1797.

*Ustilago segetum Avenae* Jens. Om Korn. Brand 61. 1888.

*Ustilago Avenae* f. *foliicola* Almeida, Revista Agron. 1: 20. 1903.

Sori in spikelets, forming a dusty olive-brown spore-mass, about 6-12 mm. long by half as wide, usually rather completely destroying floral parts, eventually becoming dissipated, rarely in leaves; spores lighter-colored on one side, subspherical to spherical though often more elongate, minutely echinulate,  $5-9\mu$  in length.

ON POACEAE:

*Avena fatua*, California.

*Avena sativa*, Alabama, California, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North



Dakota, Ohio, Oklahoma, Rhode Island, South Dakota, Tennessee, Texas, Vermont, Washington, West Virginia, Wisconsin, Wyoming; Nova Scotia.

TYPE LOCALITY: Europe, on *Avena sativa*.

DISTRIBUTION: Coextensive with the cultivation of oats.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. A3, S1-2*; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 43*; Bull. Kan. Agr. Exp. Sta. 8: *pl. 1-2*; Ann. Rep. Kan. Agr. Exp. Sta. 2: *pl. 1, 4, 5*; Bull. Iowa Agr. Exp. Sta. 54: *f. 114 (13)*; Brefeld, Unters. Gesamt. Myk. 11: *pl. 1, f. 1-4*; Ann. Rep. Mass. State Agr. Exp. Sta. 9: 248, *pl. 1, f. 1*; Tubeuf, Diseases Pl. *f. 156*.

EXSICCATI: Seym. & Earle, Econ. Fungi 81, *C 64*; Shear, N. Y. Fungi 82; Ellis & Ev. Fungi Columb. 539; Ellis, N. Am. Fungi 1092, *p. p.*; Rav. Fungi Car. II. 99.

10. *Ustilago nuda* (Jens.) Kellerm. & Swingle, Ann. Rep. Kan. Agr. Exp. Sta. 2: 277. 1890.

*Ustilago Hordei nuda* Jens. Charb. Céréales 4. 1889.

*Ustilago Hordei* Rostr. Overs. K. Danske Vid. Selsk. Forh. 1890: 10. 1890.

*Ustilagidium Hordei* Herzb. in Zopf, Beitr. Phys. Morph. Org. 5: 7. 1895.

Sori in spikelets, forming a dusty olive-brown spore-mass, about 6-10 mm. long by half as wide, temporarily protected by a thin membrane but soon becoming dissipated and leaving the naked rachis behind; spores lighter-colored on one side, minutely echinulate, subspherical to spherical or occasionally more elongate, 5-9  $\mu$  in length.

ON POACEAE:

*Hordeum* spp. cult., Connecticut, Illinois, Iowa, Kansas, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New York, North Carolina, Ohio, South Dakota, Texas, Wisconsin; Nova Scotia; Mexico.

TYPE LOCALITY: Europe, on *Hordeum* sp. cult.

DISTRIBUTION: Coextensive with the cultivation of barley in America and Europe.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. D*; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 47*; Ann. Rep. Kan. Agr. Exp. Sta. 2: *pl. 2, f. 7-11, pl. 8*; Bull. Iowa Exp. Sta. 54: *f. 114 (18)*; Ann. Rep. Mass. State Agr. Exp. Sta. 9: 248, *pl. 1, f. 2*.

EXSICCATI: Seym. & Earle, Econ. Fungi 82a, *C 77, C 78*; Ellis, Ev. & Barth. Fungi Columb. 2193.

11. *Ustilago Tritici* (Pers.) Rostr. Overs. K. Danske Vid. Selsk. Forh. 1890: 15. Mr 1890.

*Uredo segetum Tritici* Pers. Tent. Disp. Fung. 57. 1797.

*Ustilago segetum Tritici* Jens. Om Korn. Brand 61. 1888.

*Ustilago Tritici* Jens.; Kellerm. & Swingle, Ann. Rep. Kan. Agr. Exp. Sta. 2: 262. Je 1890.

*Ustilago Tritici* f. *folicola* P. Henn. Zeits. Pflanzenk. 4: 139. 1894.

*Ustilagidium Tritici* Herzb. in Zopf, Beitr. Phys. Morph. Org. 5: 7. 1895.

Sori in spikelets, forming a dusty olive-brown spore-mass, about 8-12 mm. long by half as wide, usually entirely destroying floral parts and eventually becoming dissipated and leaving behind only the naked rachis; spores lighter-colored on one side, usually subspherical to spherical, occasionally more elongate, minutely echinulate especially on the lighter side, 5-9  $\mu$  in length.

ON POACEAE:

*Triticum vulgare*, Alabama, Idaho, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, South Dakota, Tennessee, Texas, Vermont, Washington, West Virginia, Wisconsin, Wyoming; Mexico.

TYPE LOCALITY: Europe, on *Triticum vulgare*.

DISTRIBUTION: Coextensive with the cultivation of wheat.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. F 1-2, R 2, S 5*; E. & P. Nat. Pfl. 11\*\* : 9, *f. 5A*; Ann. Rep. Kan. Agr. Exp. Sta. 2: *pl. 2, f. 1-2, pl. 6*; Ann. Rep. Mass. State Agr. Exp. Sta. 9: 248, *pl. 1, f. 3*; Tubeuf, Diseases Pl. *f. 160*.

EXSICCATI: Underw. & Cook, Illustr. Fungi 56; Seym. & Earle, Econ. Fungi 80; Ellis & Ev. Fungi Columb. 1369; Sydow, Ust. 167; Kellerm. Ohio Fungi 42; Griff. West Am. Fungi 22.

12. *Ustilago Muhlenbergiae* P. Henn. Hedwigia Beibl. 41: 61. Ap 1902.

*Ustilago Muhlenbergiae* Clinton, Jour. Myc. 8: 133. O 1902. (Type from Arizona, on *Muhlenbergia texana*.)

Sori in the abortive inflorescence, ovoid to subspherical, about 3-6 mm. in length, protected by thin semitransparent membrane of the infected floral parts, upon rupture disclosing a black-brown dusty spore-mass; spores rather dark reddish-brown, chiefly spherical, at first apparently smooth, but with age or approaching germination splitting off caps on



opposite sides of epispore and these eventually breaking up into small granular echinulations thus leaving a dark, less broken central band, 4–6  $\mu$  in diameter.

ON POACEAE:

*Muhlenbergia Porteri* (*M. texana*), Arizona.

*Muhlenbergia Pringlei*, New Mexico.

TYPE LOCALITY: Hot Springs, New Mexico (not Mexico, as stated), on *Muhlenbergia Pringlei*.

DISTRIBUTION: New Mexico and Arizona.

EXSICCATI: Seym. & Earle, Econ. Fungi C 142.

13. *Ustilago residua* Clinton, Jour. Myc. 8: 133. 1902.

*Ustilago segetum* f. *Danthoniae* Ellis & Ev. N. Am. Fungi 1893a; hyponym. 1887.

Sori in the inflorescence, prominent, infecting the whole or sometimes confined to the individual spikelets, usually enclosed by leaf-sheaths, on exposure showing as an olive-brown dusty spore-mass; spores rather light olive-brown, ovoid or ovate to spherical or occasionally irregular, thin-walled, with coarse granules giving granular-reticulate appearance under an immersion, usually 5.5–8.5  $\mu$ , sometimes even 11  $\mu$ , in length.

ON POACEAE:

*Danthonia californica*, California.

*Danthonia compressa*, New York.

*Danthonia intermedia*, California, Wyoming.

*Danthonia spicata*, New Hampshire.

*Danthonia unispicata*, California.

*Danthonia* sp., Colorado.

TYPE LOCALITY: New Hampshire, on *Danthonia spicata*.

DISTRIBUTION: New Hampshire, New York, Colorado, Wyoming, and California; also in Australia.

EXSICCATI: Seym. & Earle, Econ. Fungi C 146; Ellis & Ev. N. Am. Fungi 1893a.

14. *Ustilago affinis* Ellis & Ev.; Cockerell, Bull. Torrey Club 20: 297. 1893.

*Ustilago Hilariae* P. Henn. Hedwigia 37: 267. 1898. (Type from Mexico, on *Hilaria cenchroides*.)  
Not *U. Hilariae* Ellis & Tracy. 1890.

*Ustilago Stenotaphri* P. Henn. Hedwigia 37: 293. 1898. (Type from Cape Colony, on *Stenotaphrum glabrum*.) Not *U. Stenotaphri* McAlpine. 1895.

*Ustilago americana* Speg. Anal. Mus. Nac. Buenos Aires 6: 207. 1899. (Type from La Plata, Argentina, on *Stenotaphrum glabrum*.)

*Ustilago Stenotaphri* Masee, Kew Bull. 1899: 184. 1899. (Type from Bermuda, on *Stenotaphrum glabrum*.)

*Ustilago Henningsii* Sacc. & Sydow; Sacc. Syll. Fung. 16: 368. 1902.

Sori in spikelets, usually infecting all, which are sometimes slightly merged, at first more or less hidden by enveloping leaves, protected by a thin transparent membrane but this soon rupturing and the olive-brown spore-mass scattering until there remains only the naked rachis; spores light reddish-brown, oblong or ovate to chiefly subspherical or spherical, often slightly angled, smooth, 5.5–9  $\mu$  in length.

ON POACEAE:

*Hilaria cenchroides*, Mexico.

*Stenotaphrum secundatum* (*S. americanum*), Bermuda, Jamaica.

TYPE LOCALITY: Mandeville, Jamaica, on *Stenotaphrum americanum* (*S. secundatum*).

DISTRIBUTION: Bermuda, Jamaica, and Mexico; also in South America and Africa.

15. *Ustilago Lorentziana* Thüm. Flora 63: 30. 1880.

*Ustilago Holwayi* Dietel, Bot. Gaz. 18: 253. 1893. (Type from California, on *Hordeum pratense*.)

Sori in spikelets, usually infecting all of a spike, rather completely destroying their parts except the awns, protected at first by a thin transparent membrane which easily ruptures disclosing a dusty purple-black spore-mass; spores rather dark olive-brown, ovoid to spherical or sometimes with more irregular and angular forms, with a brittle epispore that breaks up into more or less irregular granules or minute verruculations, chiefly 7–12  $\mu$  in length.

ON POACEAE:

*Hordeum caespitosum*, Utah.

*Hordeum jubatum*, Montana, North Dakota, South Dakota, Utah.

*Hordeum maritimum*, Idaho.

*Hordeum murinum*, California.

*Hordeum nodosum* (*H. pratense*), California, Utah.

*Hordeum pusillum*, California.

*Hordeum* sp., California, Washington.

TYPE LOCALITY: Argentina, on *Hordeum compressum*.  
 DISTRIBUTION: North Dakota to Washington and California; also in South America.  
 EXSICCATI: Sydow, Ust. 9, 154, 206, 305; Ellis & Ev. Fungi Columb. 1281, 2098; Ellis & Ev. N. Am. Fungi 2702; Griff. West Am. Fungi 192; Seym. & Earle, Econ. Fungi C 140.

16. *Ustilago bromivora* (Tul.) Fisch. de Waldh. Bull. Soc. Nat.  
 Mosc. 40<sup>1</sup>: 252. 1867.

*Ustilago Carbo vulgaris bromivora* Tul. Ann. Sci. Nat. III. 7: 81. 1847.  
*Cintractia patagonica* Cooke & Masee, Grevillea 18: 34. 1889. (Type from Patagonia, on *Bromus unioloides*.)

Sori in spikelets, usually infecting only the parts within the glumes but sometimes also destroying the base of these, often at first agglutinated but finally becoming dusty; spores usually dark reddish-brown, chiefly ovoid to spherical but occasionally polyhedral or irregular, sometimes apparently smooth or only granular, but usually abundantly and minutely granular-verruculose, 7-11  $\mu$ , rarely 14  $\mu$ , in length.

ON POACEAE:

*Bromus arvensis*, Colorado?  
*Bromus breviaristatus*, California, Iowa.  
*Bromus ciliatus*, Colorado.  
*Bromus Hookerianus*, California, Washington.  
*Bromus hordeaceus* (*B. mollis*), California, Washington.  
*Bromus hordeaceus glabrescens*, Washington.  
*Bromus Kalmii*, Utah.  
*Bromus marginatus*, California, Colorado, District of Columbia, Iowa, Oregon, Wyoming.  
*Bromus polyanthus*, Utah.  
*Bromus Pumpellianus*, District of Columbia.  
*Bromus racemosus*, Washington.  
*Bromus Richardsoni* District of Columbia.  
*Bromus secalinus*, California, Oregon.  
*Bromus vulgaris*, Montana, Washington.  
*Bromus vulgaris eximius*, Washington.  
*Bromus* sp., Montana, Utah.

TYPE LOCALITY: Europe, on *Bromus secalinus*.

DISTRIBUTION: District of Columbia (on cultivated plants); Iowa to Washington and California; also in South America, Europe, Asia, and Australia.

ILLUSTRATIONS: Bull. Iowa Agr. Exp. Sta. 54: f. 114 (4); Brefeld, Unters. Gesamt. Myk. 5: pl. 10, f. 1-8; Rev. Myc. 12: pl. 19, f. 280-281; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 15.

EXSICCATI: Ellis & Ev. N. Am. Fungi 3052; Sydow, Ust. 102, 202, 303; Griff. West Am. Fungi 204, 205, 206, 206a; Ellis & Ev. Fungi Columb. 536, 1995; Seym. & Earle, Econ. Fungi 534, C 65, C 136, C 137, C 138.

*Ustilago bromivora macrospora* Farl. Bull. Iowa Agr. Coll. Bot. Dep. 1886: 59. 1887. Spores somewhat more irregular and larger, chiefly 11-17  $\mu$  in length. ON POACEAE: *Bromus ciliatus*, Colorado; ? Iowa.

17. *Ustilago Crameri* Körn.; Fuckel, Jahrb. Nass. Ver. Nat. 27-28:  
 11. 1873.

Sori in the spikelets, infecting all of the spike, ovate, about 2-4 mm. in length, chiefly destroying inner and basal parts; spores reddish-brown, chiefly ovoid to subspherical though occasionally more elongate and irregular, smooth, with usually pitted contents, chiefly 8-11  $\mu$  in length.

ON POACEAE:

*Chaetochloa italica* (*Setaria italica*), Connecticut, District of Columbia, Illinois, Indiana, Iowa, Maine, Michigan, Ohio, North Dakota, South Dakota.

TYPE LOCALITY: Switzerland, on *Setaria italica* (*Chaetochloa italica*).

DISTRIBUTION: New England to Illinois and South Dakota; also in Europe.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: pl. P; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 44; Brefeld, Unters. Gesamt. Myk. 5: pl. 7, f. 18-21.

EXSICCATI: Griff. West Am. Fungi 9; Seym. & Earle, Econ. Fungi C 66, C 139.

18. *Ustilago lycuroides* Griff. Bull. Torrey Club 31: 84. 1904.

Sori in the ovaries, infecting only part of the spikelets, evident, spherical, about 1.5 mm. in diameter, covered with a greenish membrane bearing remains of styles at its apex, upon rupture disclosing a compact, dusty, black-brown spore-mass; spores clear reddish-brown, ovoid to subspherical, smooth but because of clear granular contents often appearing pitted, chiefly 10.5-14  $\mu$  in length.



## ON POACEAE:

*Lycurus phleoides*, Arizona.TYPE LOCALITY: One mile north of Greaterville on road to Rosemont, Santa Rita Mountains, Arizona, on *Lycurus phleoides*.

DISTRIBUTION: Arizona.

ILLUSTRATION: Bull. Torrey Club 31: 85, f. 11, 12.

19. *Ustilago Rickerii* Clinton, sp. nov.

Sori in the ovaries, apparently infecting all in the inflorescence, ovoid to subspherical, about 3–6 mm. in length, covered by a smooth membrane of plant tissue that upon rupture discloses the olive-black dusty spore-mass; spores reddish-brown, ovoid to chiefly subspherical or spherical, contents usually guttulate, apparently smooth, but under an immersion lens usually minutely and sparsely granular-echinulate, 5.5–9  $\mu$  in length.

## ON POACEAE:

*Panicum paspaloides*, Cuba.

Type collected in Batabano, Cuba, March, 1906, by A. S. Hitchcock, and communicated by P. L. Ricker as an interesting species.

20. *Ustilago Panici-proliferi* P Henn. Bot. Gaz. 28: 274. 1899.

Sori in the inner folded leaves and possibly also aborting the inflorescence, elongate, chiefly 3–8 cm. in length, often thickest at base, more or less enveloped by leaf-sheaths, covered with a thin transparent membrane that soon ruptures, exposing the dusty olive-black spore-mass surrounding the prominent, elongate remains of the plant tissues; spores olive-brown, chiefly ovoid to spherical, contents often punctate, smooth, 7–10  $\mu$  in length.

## ON POACEAE:

*Panicum paspaloides*, Mexico.*Panicum proliferum acuminatum*, Mexico.TYPE LOCALITY: City of Mexico, on *Panicum proliferum acuminatum*.

DISTRIBUTION: Mexico.

EXSICCATI: Sydow, Ust. 212; Seym. &amp; Earle, Econ. Fungi C 143.

21. *Ustilago Ulei* P. Henn. Hedwigia 34: 88. 1895.

Sori in the leaves, rather indefinite, in striae or often involving more or less of the inner surface of the blades as folded together, eventually causing them to become somewhat shredded and the olive-black dusty spore-mass to become scattered; spores reddish-brown, often with thin walls (such spores easily collapsing when dry), usually subspherical or spherical, smooth or very minutely punctate-verruculose, 8–11  $\mu$  in diameter.

## ON POACEAE:

*Chloris submutica*, Mexico.TYPE LOCALITY: Goyaz, Brazil, on *Chloris* sp.

DISTRIBUTION: Mexico; also in South America.

ILLUSTRATION: Brefeld, Unters. Gesamt. Myk. 12: pl. 7, f. 14–18.

22. *Ustilago chloridicola* P. Henn. Hedwigia 37: 267. 1898.

Sori in the inflorescence, linear, often about 3 cm. in length, causing more or less shredding of the infected tissues, with dusty olive-black spore-mass that becomes scattered; spores reddish-brown, often irregular, oblong or elliptical to spherical, apparently minutely verruculose, but punctate-reticulate under an immersion lens, 6–11  $\mu$  in length.

## ON POACEAE:

*Chloris* sp., California.TYPE LOCALITY: Potter Valley, Mendocino County, California, on *Chloris* sp.

DISTRIBUTION: California.

23. *Ustilago Tillandsiae* Patters.; Clinton, Jour. Myc. 8: 135. 1902.

Sori destroying inner flower parts, protected by enclosing bracts and perianth, forming an irregular dusty black spore-mass about 1–3 cm. in length; spores olive-brown, chiefly ovoid to spherical, thin-walled, more or less collapsed or hemispherically cupped, smooth or with brittle epispore breaking up into thin polygonal areas, 7–13  $\mu$  in length.

## ON BROMELIACEAE:

*Tillandsia Leiboldiana*, Mexico.*Tillandsia* sp., Costa Rica.TYPE LOCALITY: Costa Rica, on *Tillandsia* sp.

DISTRIBUTION: Mexico and Costa Rica.

24. *Ustilago olivacea* (DC.) Tul. Ann. Sci. Nat. III. 7: 88. 1847.

*Uredo olivacea* DC. Fl. Fr. 6: 78. 1815.

*Ustilago caricicola* Tracy & Earle, Bull. Torrey Club 26: 493. 1899. (Type from Mississippi, on *Carex folliculata*.)

Sori in occasional ovaries, often at first more or less concealed by perigynium, forming rounded bodies 2–6 mm. in diameter, at first with firmly agglutinated spore-mass but finally more or less dusty, usually with conspicuous threads intermingled with the spores; spores light olive-brown, usually irregular, varying from linear to oblong or subspherical, but in some instances more regular and then chiefly subspherical or spherical, very minutely verruculose, usually 5–9  $\mu$ , but the most elongate occasionally 14  $\mu$ , in length.

ON CYPERACEAE:

*Carex cladostachya* (*C. polystachya*), Mexico.

*Carex folliculata australis*, Mississippi.

*Carex turgescens*, Florida.

*Carex utriculata*, Washington, Wisconsin.

*Carex* sp., Mexico, Jamaica.

TYPE LOCALITY: France, on *Carex riparia*.

DISTRIBUTION: Wisconsin to Washington, Florida, Mexico and Jamaica; also in South America, Europe, and Asia.

ILLUSTRATIONS: Brefeld, Unters. Gesammt. Myk. 5: pl. 10, f. 9–26; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 11.

25. *Ustilago Sieglingiae* Ricker, Jour. Myc. 11: 112. 1905.

Sori in ovaries, infecting all, ellipsoidal, about 2–4 mm. in length, protected by thin membrane and enveloping glumes, finally shedding the dusty dark-brown spore-mass; spores rather uniformly colored, medium-dark reddish-brown, ellipsoidal to chiefly subspherical or spherical, occasionally more elongate or irregular, smooth or very minutely and obscurely echinulate, 4–6  $\mu$ , or the most elongate 7  $\mu$ , in length.

ON POACEAE:

*Triplasis purpurea*, Florida.

TYPE LOCALITY: Punta Rassa, Florida, on *Sieglingia purpurea* (*Triplasis purpurea*).

DISTRIBUTION: Florida.

26. *Ustilago Triplasidis* Ellis & Ev.; Clinton, Proc. Bost. Soc. Nat. Hist. 31: 355. 1904.

Sori in ovaries, ellipsoidal, about 3–4 mm. in length, protected by thin membrane, showing between the glumes of most of the spikelets; spores light reddish-brown, often lighter-colored on one side, ovoid to chiefly subspherical or spherical, usually abundantly but very minutely echinulate, 5–9  $\mu$  in length.

ON POACEAE:

*Triplasis americana*, Mississippi.

TYPE LOCALITY: Deer Island, Biloxi, Mississippi, on *Triplasis americana*.

DISTRIBUTION: Mississippi.

27. *Ustilago sparsa* Underw. Bull. Torrey Club 24: 86. 1897.

Sori in the ovaries, ovate, usually infecting few of the spikelets, about 2–3 mm. in length, with rupture of the covering disclosing a dusty brown-black spore-mass; spores light reddish-brown, ovoid or ovate to spherical, distinctly echinulate, chiefly 6–10  $\mu$  in length.

ON POACEAE:

*Dactyloctenium aegyptium*, Alabama, South Carolina.

TYPE LOCALITY: Auburn, Alabama, on *Dactyloctenium aegyptium*.

DISTRIBUTION: Alabama and South Carolina.

EXSICCATI: Rav. Fungi Am. 790; Seym. & Earle, Econ. Fungi C 86.

28. *Ustilago spermophora* B. & C.; (Ellis, N. Am. Fungi 1098; hyponym. 1883) Sacc. Syll. Fung. 7<sup>2</sup>: 466. 1888.<sup>1</sup>

Sori in the ovaries, usually infecting only a few in the spikelets, ovate, small, 1–2 mm. in length, sometimes bearing remains of unaffected part of ovary at apex, protected by a

<sup>1</sup> Listed in Curt. Cat. Pl. N. Car. 123, in 1867.



thin membrane; spores light-brown, ovoid to subspherical, usually prominently echinulate, 8–13  $\mu$  in length.

ON POACEAE:

*Eragrostis hypnoides* (*E. reptans*), District of Columbia, South Dakota, Wisconsin.

*Eragrostis major*, Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Massachusetts, Mississippi, Nebraska, New York, North Carolina, South Carolina, South Dakota, Wisconsin.

TYPE LOCALITY: Society Hill, South Carolina, on *Poa megastachya* (*Eragrostis major*).

DISTRIBUTION: Connecticut to Mississippi and South Dakota; also in South America and Europe.

ILLUSTRATIONS: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 52; Bull. Iowa Agr. Exp. Sta. 54: f. 114 (11).

EXSICCATI: Ellis, N. Am. Fungi 1098; Rab.-Wint. Fungi Eur. 3402; Griff. West Am. Fungi 207, 208; Seym. & Earle, Econ. Fungi C 87; Ellis, Ev. & Barth. Fungi Columb. 2195.

29. *Ustilago Boutelouae* Kellerm. & Swingle, Jour. Myc. 5: 13. 1889.

Sori in the ovaries, 2–4 mm. in length, more or less concealed by the glumes but at maturity becoming evident on rupture of the covering membrane by the dusty olive-brown spore-mass; spores reddish-brown, chiefly ovoid to spherical, conspicuously echinulate, 8–13  $\mu$  in length.

ON POACEAE:

*Bouteloua oligostachya*, Kansas, Oklahoma, Nebraska.

TYPE LOCALITY: Manhattan, Kansas, on *Bouteloua oligostachya*.

DISTRIBUTION: Nebraska to Oklahoma.

ILLUSTRATIONS: Jour. Myc. 5: pl. 1, f. 26–40; Trans. Acad. Sci. St. Louis 7: pl. 29, f. 11.

EXSICCATI: Ellis, Ev. & Barth. Fungi Columb. 2192

30. *Ustilago Tricuspidis* Ellis & Gall.; Clinton, Jour. Myc. 8: 135. 1902.

Sori in ovaries, ellipsoidal, about 4 mm. in length, infecting an occasional spikelet and showing between the spreading glumes; spores medium reddish-brown, ovoid to chiefly subspherical or spherical, rather prominently verruculo-echinulate, chiefly 8–11  $\mu$  in length.

ON POACEAE:

*Tridens seslerioides* (*Tricuspis seslerioides*), Missouri, West Virginia.

TYPE LOCALITY: Charleston, Missouri, on *Triodea cuprea* (*Tridens seslerioides*).

DISTRIBUTION: West Virginia and Missouri.

31. *Ustilago minor* J. B. S. Norton, Trans. Acad. Sci.

St. Louis 7: 238. 1896.

Sori on the leaves and leaf-sheaths, forming ovoid to linear pustules, 1–5 mm. or even longer, with the covering membrane at maturity becoming ruptured and the dusty black-brown spore-mass scattered; spores light to medium-dark reddish-brown, chiefly ovoid to spherical, minutely echinulate, mostly 7–9  $\mu$  in length.

ON POACEAE:

*Bouteloua hirsuta*, Kansas.

TYPE LOCALITY: Manhattan, Kansas, on *Bouteloua hirsuta*.

DISTRIBUTION: Kansas.

ILLUSTRATION: Trans. Acad. Sci. St. Louis 7: pl. 28, f. 3, pl. 29, f. 5, 12.

32. *Ustilago Hieronymi* Schröt.; P. Henn. Hedwigia 35: 213. 1 Au 1896.

*Ustilago filifera* J. B. S. Norton, Trans. Acad. Sci. St. Louis 7: 237. 9 N 1896. (Type from Kansas, on *Bouteloua racemosa*.)

Sori in the leaves and leaf-sheaths, usually forming oblong sausage-shaped pustules, chiefly 1–5 mm. or apparently by terminal coalescence more elongate, at first firmly agglutinated but eventually with the thin membrane rupturing and the dusty black spore-mass becoming scattered; spores dark reddish-brown, more or less irregularly polyhedral, occasionally oblong or ovoid, to subspherical, rather obscurely echinulate, 11–16  $\mu$ , in some specimens the most elongate rarely 20  $\mu$ , in length.

ON POACEAE:

*Atheropogon curtispendus* (*Bouteloua racemosa*), Arizona, Kansas, Texas, (Utah.)

*Bouteloua breviseta*, New Mexico.

*Bouteloua bromioides*, Arizona.

*Bouteloua eriopoda*, Arizona.

*Bouteloua Havardii*, Arizona.

*Bouteloua oligostachya*, Arizona, Colorado, Kansas, Montana, New Mexico.

*Bouteloua polystachya*, Arizona.

*Dasyochloa pulchella* (*Triodia pulchella*), Arizona.

*Pappophorum Wrightii*, Arizona.

*Triathera aristidoides* (*Bouteloua aristidoides*), Arizona, Mexico.

TYPE LOCALITY: Argentina, on *Bouteloua ciliata*.

DISTRIBUTION: Montana to Texas, Arizona and Mexico; also in South America.

ILLUSTRATIONS: Trans. Acad. Sci. St. Louis 7: pl. 28, f. 1-2, 4-6, pl. 29, f. 1-4, 9, 10.

EXSICCATI: Griff. West Am. Fungi 217, 217a, 218, 219, 220, 224, 227.

### 33. *Ustilago Buchloes* Ellis & Tracy, Jour. Myc. 6: 77. 1890.

Sori on leaves, usually forming sausage-shaped pustules, ovoid to linear, 3-10 mm. in length, at first covered by thin grayish membrane which soon ruptures and black-brown spore-mass becomes scattered; spores dark reddish-brown, ellipsoidal to spherical or occasionally somewhat angled, smooth or very obscurely verruculose, 13-16  $\mu$  in length.

ON POACEAE:

*Bulbilis dactyloides* (*Buchloe dactyloides*), Nebraska, New Mexico.

TYPE LOCALITY: Coolidge, New Mexico, on *Buchloe dactyloides* (*Bulbilis dactyloides*).

DISTRIBUTION: Nebraska and New Mexico.

ILLUSTRATION: Bull. Iowa Agr. Exp. Sta. 54: f. 114 (8).

### 34. *Ustilago pustulata* Tracy & Earle, Bull. Torrey Club 22: 175. 1895.

Sori usually in ovaries, sometimes also in stamens, forming ovate bodies about 2-4 mm. in length, occasionally on stem near nodes or at base of inflorescence and then forming more conspicuous often nodular swellings one to several centimeters in length, with dehiscence of the thin smooth membrane disclosing a dusty olive-brown spore-mass; spores chiefly ovoid to spherical, occasionally more irregular, usually prominently echinulate, 9-12  $\mu$ , the most elongate rarely 15  $\mu$ , in length.

ON POACEAE:

*Panicum proliferum*, Illinois, Iowa, Kansas, Mississippi, Nebraska.

*Panicum virgatum*, Texas.

TYPE LOCALITY: Starkville, Mississippi, on *Panicum proliferum*.

DISTRIBUTION: Illinois to Nebraska, Mississippi and Texas.

ILLUSTRATION: Bull. Iowa Agr. Exp. Sta. 54: f. 114 (2).

EXSICCATI: Ellis & Ev. N. Am. Fungi 3339; Seym. & Earle, Econ. Fungi C 84; Ellis, Ev. & Barth. Fungi Columb. 2194.

### 35. *Ustilago sphaerogena* Burrill; (Ellis & Ev. N. Am. Fungi 1892; hyponym. 1887) Sacc. Syll. Fung. 7<sup>2</sup>: 468. 1888.

*Cintractia sphaerogena* Hume, Proc. Iowa Acad. Sci. 9: 233. 1902.

Sori in ovaries, ovate, chiefly 3-6, rarely 10, mm. in length, covered with a tough hispid membrane which ruptures irregularly from apex disclosing at first an agglutinated but finally a dusty olive-brown spore-mass; spores ovoid to subspherical, prominently and sharply echinulate, chiefly 9-12  $\mu$  in length.

ON POACEAE:

*Echinochloa colona* (*Panicum colonum*), Texas.

*Echinochloa Crus-galli* (*Panicum Crus-galli*), Connecticut, Illinois, Iowa, Missouri, Nebraska, North Carolina; Mexico.

*Echinochloa Walteri* (*Panicum Walteri*), Delaware.

TYPE LOCALITY: Osborne, Illinois, on *Panicum Crus-galli* (*Echinochloa Crus-galli*).

DISTRIBUTION: Connecticut to Nebraska, North Carolina, and Mexico.

ILLUSTRATIONS: Bot. Gaz. 19: pl. 18, f. 5-7; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 53; Bull. Iowa Agr. Exp. Sta. 54: f. 120 (7).

EXSICCATI: Ellis & Ev. N. Am. Fungi 1892; Seym. & Earle, Econ. Fungi C 88, C 147; Rab.-Wint.-Paz. Fungi Eur. 4307.

There is some question whether this species is distinct from *Ustilago trichophora* (Link) J. Kunze reported by Körnicke on *Panicum colonum* from Egypt. The same host has been found in this country with a smut, and a recent examination of the specimens shows it to be the same as *Ustilago sphaerogena*, except the sori are somewhat smaller.

### 36. *Ustilago Crus-galli* Tracy & Earle, Bull. Torrey Club 22: 175. 1895.

*Cintractia Seymouriana* Magn. Ber. Deuts. Bot. Ges. 14: 217. 1896. (Type from Wellesley, Massachusetts, on *Panicum Crus-galli*.)

*Cintractia Crus-galli* Magn. Ber. Deuts. Bot. Ges. 14: 392. 1896.

Sori often encircling stem at nodes or at the place of the inflorescence infecting both stem and leaves, prominent, often nodular, one to several centimeters in length, protected by



tough hispid membrane which upon rupture discloses an olive-brown dusty spore-mass; spores ovoid to spherical, occasionally more elongate, rather bluntly echinulate or even verruculose, chiefly  $10-14\ \mu$  in length.

## ON POACEAE:

*Echinochloa Crus-galli* (*Panicum Crus-galli*), Arkansas, Colorado, Connecticut, Illinois, Massachusetts, Minnesota, Oregon, South Dakota, Utah, Washington.

*Echinochloa Walteri* (*Panicum Walteri*), Delaware.

TYPE LOCALITY: Salt Lake City, Utah, on *Panicum Crus-galli* (*Echinochloa Crus-galli*). X

DISTRIBUTION: New England to Delaware, Utah and Washington.

ILLUSTRATIONS: Bull. Iowa Agr. Exp. Sta. 54: f. 120 (6); Ber. Deuts. Bot. Ges. 14: pl. 15, f. 1-14.

EXSICCATI: Sydow, Ust. 125, 179; Vest. Micr. Rar. Sel. 324; Griff. West Am. Fungi 212, 212a; Seym. & Earle, Econ. Fungi C 67.

### 37. *Ustilago heterogena* P. Henn. Hedwigia 43: 155. 1904.

Sori on various parts of host, most frequently at nodes of the stem, involving the axial growths and transforming them entirely or their base into a conspicuous tumor, ovate to elongate-lanceolate, often 40 by 15 mm., covered by the thick, smooth envelope of plant tissues, finally rupturing and disclosing a brown-black semi-agglutinated to dusty spore-mass; spores medium to dark reddish-brown, chiefly ovoid to spherical, conspicuously echinulate,  $10-14\ \mu$ , rarely  $16\ \mu$ , in length.

## ON POACEAE:

*Leptochloa scabra* Louisiana.

TYPE LOCALITY: Brazil, on *Leptochloa virgata*.

DISTRIBUTION: Louisiana; also in South America.

### 38. *Ustilago Zeae* (Beckm.) Unger, Einfl. Bodens 211. 1836.

*Lycoperdon Zeae* Beckm. Hannov. Mag. 6: 1330. 1768.

*Uredo Zeae* Schw. Schr. Nat. Ges. Leipzig 1: 71. 1822.

*Ustilago Maydis* Corda, Ic. Fung. 5: 3. 1842.

*Ustilago Schweinitzii* Tul. Ann. Sci. Nat. III. 7: 86. 1847.

*Ustilago Zeae-Mays* Wint.; Rab. Krypt. Fl. 1<sup>1</sup>: 97. 1881.

*Ustilago Euchlaenae* Arcang. Erb. Critt. Ital. II. 1152. 1882. (Type from Italy, on cult. *Euchlaena luxurians*.)

*Ustilago Mays-Zeae* Magn. Deuts. Bot. Monats. 13: 50. 1895.

Sori on any part of the host, usually prominent, forming irregular swellings from a few mm. to over a dm. in diameter, at first protected by a sort of false white membrane composed of plant cells and semi-gelatinized fungous threads, soon rupturing and disclosing a reddish-brown spore-mass; spores ellipsoidal to spherical or rarely more irregular, prominently though rather bluntly echinulate,  $8-11\ \mu$ , the most elongate  $15\ \mu$ , in length.

## ON POACEAE:

*Euchlaena luxurians*, Alabama, Connecticut, Illinois, Iowa, Kansas, Wisconsin.

*Zea Mays*, Alabama, California, Connecticut, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Vermont, West Virginia, Wisconsin, Utah; Ontario; Mexico; Cuba; Porto Rico.

TYPE LOCALITY: France, on *Zea Mays*.

DISTRIBUTION: Coextensive with the cultivation of maize.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 2, f. 1-17; Jour. Myc. 5: pl. 2-7; Ann. Rep. Conn. Agr. Exp. Sta. 1889: pl. 2, f. 15; Trans. Acad. Sci. St. Louis 7: pl. 25, f. 6-13; Ann. Rep. Ind. Agr. Exp. Sta. 12: pl. 10-13; Bull. Ill. Agr. Exp. Sta. 57: pl. G, H, I, J, K, R 3, T 1-3; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 2, 55; Bull. Kan. Agr. Exp. Sta. 62: pl. 1-3, 5, 7; Brefeld, Unters. Gesammt. Myk. 5: pl. 4, f. 1-16, 11: pl. 2-5; Ber. Deuts. Bot. Ges. 20: pl. 11; Bull. Soc. Myc. Fr. 14: pl. 12; Tubeuf, Diseases Pl. f. 148-152.

EXSICCATI: Rav. Fungi Car. IV. 100; Rav. Fungi Am. 281; Underw. & Cook, Illustr. Fungi 55; Seym. & Earle, Econ. Fungi 71 a-b, C 97, C 98, C 99, C 100; Shear, N. Y. Fungi 135; Sydow, Ust. 157; Griff. West Am. Fungi 99; Kellerm. Ohio Fungi 16; Kellerm. & Swingle, Kan. Fungi 25.

### 39. *Ustilago Kellermanii* Clinton, sp. nov.

Sori involving terminal and nodal growths (aborting the inflorescence), converting them into very elongate outbreaks, enwrapped by the leaf-sheaths but with the internal tissues shredded and mixed with the dusty brown-black spore-mass; spores dark reddish-brown, ovoid to spherical, occasionally more elongate or irregular, prominently and coarsely verruculose, chiefly  $10-14\ \mu$  in length.



## ON POACEAE :

? *Euchlaena luxurians*, Guatemala.

Type collected near Guatemala City, March, 1906, by W. A. Kellerman (no. 5078), in a field cultivated for fodder, apparently of teosinte. The elongate shredded outbreaks and the somewhat larger, darker-colored and coarsely verruculose spores distinguish this species from *Ustilago Zeae*.

40. *Ustilago neglecta* Niessl; Rab. Fungi Eur. 1200. 1868.

*Erysibe Panicorum Panici-glauci* Wallr. Fl. Crypt. Germ. 2: 216. 1833.

*Ustilago Panici-glauci* Wint.; Rab. Krypt. Fl. 1<sup>1</sup>: 97. 1881.

Sori in spikelets, infecting all of the spike, ovate, 2–3 mm. in length, enclosed by glumes, soon rupturing and disclosing a dusty dark-brown spore-mass; spores dark-brown, usually ovoid to spherical or sometimes more elongate, prominently and abundantly echinulate, chiefly 10–14  $\mu$ , in length.

## ON POACEAE :

*Chaetochloa glauca* (*Setaria glauca*), Connecticut, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Minnesota, Nebraska, New Hampshire, New Jersey, New York, Ohio, South Dakota, Vermont, Wisconsin.

TYPE LOCALITY: Gratz, Austria, on *Setaria glauca* (*Chaetochloa glauca*).

DISTRIBUTION: New England and New Jersey to South Dakota and Kansas; also in South America and Europe.

ILLUSTRATIONS: Trans. Acad. Sci. St. Louis 7: pl. 28, f. 7–8; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 49; Bull. Iowa Agr. Exp. Sta. 54: f. 114 (7).

EXSICCATI: Ellis, N. Am. Fungi 286; Seym. & Earle, Econ. Fungi, 65 a–b, 65 c, C 81; Barth. Ellis & Ev. Fungi Columb. 1700; Griff. West Am. Fungi 13.

41. *Ustilago Uniolae* Ellis & Ev. Jour. Myc. 3: 56. 1887.

Sori in ovaries, showing between the glumes as slightly swollen ovoid bodies, about 2–4 mm. in length, rather firm, with a semi-agglutinated or finally dusty spore-mass; spores dark reddish-brown, oblong or ovate to spherical or occasionally angled and irregular, obscurely and minutely verruculose, 9–13  $\mu$  in length.

## ON POACEAE :

*Uniola laxa* (*U. gracilis*), Delaware, Georgia, Mississippi, Texas.

TYPE LOCALITY: Texas, on *Uniola gracilis* (*U. laxa*).

DISTRIBUTION: Delaware to Texas.

EXSICCATI: Seym. & Earle, Econ. Fungi C 93, C 149.

42. *Ustilago Eriocauli* (Masse) Clinton, Jour. Myc. 8: 137. 1902.

*Cintractia Eriocauli* Massee, Grevillea 22: 67. 1894.

*Ustilago Eriocauli* Clinton, Rhodora 3: 82. 1901. (Type from Massachusetts, on *Eriocaulon septangulare*.)

Sori in ovaries, inconspicuous, hidden by floral envelopes, black, ovoid, distinctly two-lobed, usually 0.75 mm. long by 1 mm. wide, firm, with a tightly packed dark-olive spore-mass; spores polyhedral to subspherical or occasionally more elongate, rather prominently verruculose, 9–15  $\mu$  in length.

## ON ERIOCAULACEAE :

*Eriocaulon septangulare* Connecticut, Massachusetts, New Hampshire.

TYPE LOCALITY: Madagascar, on *Eriocaulon fenestratum*.

DISTRIBUTION: New England; also in Madagascar.

ILLUSTRATION: Rhodora 3: 81, f. 2.

EXSICCATI: Seym. & Earle, Econ. Fungi C 68.

43. *Ustilago ornata* Tracy & Earle, Bull. Torrey Club 22: 175. 1895.

Sori in ovaries, rather inconspicuous, showing between the glumes as ovoid bodies 1–2 mm. in length; spores brown, chiefly subspherical or spherical, occasionally ovate or ovoid, very conspicuously verrucose or echinulate, 10–14  $\mu$  in length.

## ON POACEAE :

*Leptochloa mucronata*, Mississippi.

TYPE LOCALITY: Starkville, Mississippi, on *Leptochloa mucronata*.

DISTRIBUTION: Known only from the type locality.

EXSICCATI: Ellis & Ev. N. Am. Fungi 3340; Seym. & Earle, Econ. Fungi 542.

44. *Ustilago Sporoboli* Tracy & Earle, Bull. Torrey Club

23: 211. 1896.

Sori in ovaries, ovate, about 2 mm. in length, forming rather firm compact spore-masses; spores medium-dark reddish-brown, ovoid to spherical with prominent coarse subhyaline tubercles, 11–15  $\mu$  in length.



## ON POACEAE :

*Sporobolus ejuncidus* (*S. junceus*), Mississippi.

TYPE LOCALITY : Columbus, Mississippi, on *Sporobolus junceus* (*S. ejuncidus*).

DISTRIBUTION : Known only from the type locality.

45. *Ustilago Vilfae* Wint. Bull. Torrey Club 10 : 7. 1883.

*Tilletia subfusca* Hume, Proc. Iowa Acad. Sci. 9 : 235. 1902. (Type from Iowa, on *Sporobolus neglectus*.)

Sori in the inflorescence, converting it into an elongate dusty spore-mass 1-2 cm. in length, at first completely hidden by the enveloping leaf-sheath ; spores dark reddish-brown, ovoid or rarely oblong to spherical, often slightly angled, more or less prominently verruculose, chiefly 12-16  $\mu$ , rarely 19  $\mu$ , in length.

## ON POACEAE :

*Sporobolus neglectus*, Iowa, Nebraska.

*Sporobolus vaginaeflorus*, Kansas, Nebraska, Pennsylvania.

TYPE LOCALITY : Chester County, Pennsylvania, on *Vilfa vaginaeflora* (*Sporobolus vaginaeflorus*).

DISTRIBUTION : Pennsylvania ; Iowa to Nebraska.

EXSICCATI : Ellis, N. Am. Fungi 1093 ; Ellis, Ev. & Barth. Fungi Columb. 2197.

46. *Ustilago Rabenhorstiana* Kühn, Hedwigia 15 : 4. 1876.

*Caeoma Syntherismae* Schw. Trans. Am. Phil. Soc. II. 4 : 290. 1832. (Type from North Carolina, on *Syntherisma* sp.)

*Ustilago Cesatii* Fisch. de Waldh. Aperçu Syst. Ust. 25, p.p. 1877.

*Ustilago Syntherismae* Cooke, Grevillea 6 : 138. 1878. Not *U. Syntherismae* Peck. 1875.

Sori usually involving the entire inflorescence, linear-oblong, 3-5 cm. in length, at first hidden by enveloping leaf-sheaths but finally more or less visible as a black-brown dusty mass of spores surrounding the elongate remnants of the inflorescence ; spores reddish olive-brown, ovoid to spherical or occasionally somewhat angled, echinulate or verruculose, usually 10-14  $\mu$  in length.

## ON POACEAE :

*Syntherisma filiforme* (*Panicum filiforme*), New Jersey ; Mexico (Guadalajara).

*Syntherisma fimbrialum* (*P. fimbrialum*), Mexico (Guadalajara).

*Syntherisma humifusum* (*P. glabrum*), Iowa, Illinois, Kansas, Minnesota, New Hampshire.

*Syntherisma sanguinale* (*P. sanguinale*), Alabama, Connecticut, Delaware, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kansas, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Texas, Wisconsin.

*Syntherisma* (*Panicum*) sp., New York, South Carolina.

TYPE LOCALITY : Europe, on *Panicum sanguinale* (*Syntherisma sanguinale*).

DISTRIBUTION : New England to Georgia, Minnesota, and Mexico ; also in Europe and Australia.

ILLUSTRATIONS : Trans. Acad. Sci. St. Louis 7 : pl. 26, f. 4-5, pl. 27, f. 6-8 ; Bull. Conn. Geol. Nat. Hist. Surv. 5 : f. 50 ; Bull. Iowa Agr. Exp. Sta. 54 : f. 114 (14) ; Ann. Rep. N. J. Agr. Exp. Sta. 1898 : 334, pl. 12.

EXSICCATI : Ellis, N. Am. Fungi 287, 1890<sup>b</sup> ; Seym. & Earle, Econ. Fungi 63, 63<sup>b</sup>, C 85, C 144, C 145 ; Rab.-Wint.-Paz. Fungi Eur. 4010 ; Sydow, Ust. 164 ; Rav. Fungi Am. 56.

47. *Ustilago Holwayana* P. Henn. Bot. Gaz. 28 : 274. 1899.

Sori in the inflorescence, elongate, 2 cm. or more in length, concealed by leaf-sheaths, at first covered by a thin membrane which soon ruptures disclosing a black-brown dusty spore-mass surrounding remains of inflorescence as a columella ; spores medium-dark reddish-brown, ovoid to spherical or occasionally slightly angled, rather prominently echinulate, 12-16  $\mu$  in length.

## ON POACEAE :

*Paspalum velutinum*, Mexico.

TYPE LOCALITY : Patzcuaro, Michoacan, Mexico, on *Paspalum velutinum*.

DISTRIBUTION : Mexico.

48. *Ustilago Aegopogonis* P. Henn. Hedwigia 37 : 267. 1898.

Sori elongate-ellipsoidal, 5-10 mm. in length, enclosed in leaf-sheaths, possibly aborting the inflorescence but the dusty black spore-mass without remains of plant tissues ; spores dark reddish-brown, subopaque, broadly oblong or ovate to spherical or often slightly angled, rather obscurely verruculo-echinulate, chiefly 11-14  $\mu$  in length.

## ON POACEAE :

*Aegopogon cenchroides*, Mexico.

*Hilaria cenchroides*, Arizona.

TYPE LOCALITY : Near City of Mexico, Mexico, on *Aegopogon cenchroides*.  
DISTRIBUTION : Arizona and Mexico.

49. *Ustilago Hilariae* Ellis & Tracy, Jour. Myc. 6 : 77. 1890.

*Uredo Hilariae* Sacc. Syll. Fung. 9 : 333. 1891.

Sori in the inflorescence and somewhat in the enveloping leaves, usually elongate, 0.5-1.5 cm. in length, covered by a thin whitish membrane through which the dark spore-mass shows, or hidden entirely by unaltered enveloping parts; spores light reddish-brown, usually subspherical or spherical or occasionally ovoid, minutely echinulate, chiefly 13-17  $\mu$  in length.

ON POACEAE :

*Hilaria Jamesii*, Colorado, New Mexico.

*Hilaria mutica*, Arizona.

TYPE LOCALITY : Albuquerque, New Mexico, on *Hilaria Jamesii*.

DISTRIBUTION : Colorado, New Mexico, and Arizona.

50. *Ustilago Mulfordiana* Ellis & Ev. Bull. Torrey Club 22 : 362. 1895.

*Tilletia mixta* Masee, Kew Bull. 1899 : 145, *p.p.* 1899.

*Ustilago Festucae-tenellae* P. Henn. Hedwigia Beibl. 41 : 61. 1902. (Type from Mexico, on *Festuca tenella*.)

Sori in the inflorescence (often destroying only basal part) and the enveloping leaves, elongate, usually 1-2 cm. in length, covered by the thin whitish epidermis or by the less altered opaque parts; spores nearly opaque, dark reddish-brown, ovoid to spherical or somewhat irregular, when dry laterally compressed, rather coarsely though obscurely verruculose, chiefly 12-16  $\mu$ , occasionally even 18  $\mu$ , in length.

ON POACEAE :

*Festuca microstachya*, Washington.

*Festuca octoflora* (*F. tenella*), Arizona, Idaho, Montana, Oregon, Utah, Washington, Wyoming; Mexico.

*Festuca* sp., California, Idaho.

TYPE LOCALITY : Near Boise City, Idaho, on *Festuca* sp.

DISTRIBUTION : Montana to Washington and Mexico.

EXSICCATI : Ellis & Ev. N. Am. Fungi 1895; Seym. & Earle, Econ. Fungi C 76; Griff. West Am. Fungi 229, 229<sup>a</sup>, 230.

51. *Ustilago elegans* Griff. Bull. Torrey Club 29 : 292. 1902.

Sori in the inflorescence, hidden by leaves and sheaths, sometimes showing through at the base, with a dusty black-brown spore-mass through which remains of the inflorescence are distributed as slender threads; spores dark reddish-brown, ovoid to chiefly spherical, minutely and rather obscurely verruculose, 10-14  $\mu$  in diameter.

ON POACEAE :

*Chloris elegans*, Arizona.

TYPE LOCALITY : Cochise, Arizona, on *Chloris elegans*.

DISTRIBUTION : Arizona.

ILLUSTRATION : Bull. Torrey Club 29 : 291, *f. 3*.

EXSICCATI : Griff. West Am. Fungi 309.

52. *Ustilago Dieteliana* P. Henn. Hedwigia 37 : 268. 1898.

Sori very elongate, often 1 or more dm. in length, at apex of culm, enveloped by leaves and leaf-sheaths, apparently infecting inner leaves as well as inflorescence and changing these into elongate shredded filaments scattered among the at first agglutinated but finally dusty olive-black spore-mass; spores dark reddish-brown, chiefly ovoid or ovate to spherical, rather prominently verruculose, 9-14  $\mu$  in length.

ON POACEAE :

*Tripsacum dactyloides*, Mexico.

TYPE LOCALITY : Near City of Mexico, Mexico, on *Tripsacum dactyloides*.

DISTRIBUTION : Mexico.

EXSICCATI : Sydow, Ust. 152.

53. *Ustilago striaeformis* (Westend.) Niessl, Hedwigia 15 : 1. 1876.

*Uredo striaeformis* Westend. Bull. Acad. Roy. Belg. 18<sup>2</sup> : 406. 1851.

*Tilletia Debaryana* Fisch. de Waldh.; Rab. Fungi Eur. 1097. 1866. (Type from Europe, on *Holcus mollis*.)

*Tilletia striaeformis* Oud. Bot. Zeit. 36 : 441. 1878.



*Ustilago washingtoniana* Ellis & Ev. Bull. Torrey Club 22: 57. 1895. (Type from Washington, on unknown grass.)

Sori in leaves, rarely in the inflorescence, from short-linear often extending apparently by terminal fusion for several cm., also occasionally fusing laterally to cover most of leaf, at first covered by epidermis but this soon ruptured and dusty brown-black lines of spores becoming scattered and leaves shredded; spores usually ellipsoidal to spherical, occasionally irregular, prominently echinulate, chiefly 9-14  $\mu$  in length.

ON POACEAE:

*Agrostis alba vulgaris*, Connecticut, Illinois, Iowa, Missouri.

*Ammophila arenaria* (*A. arundinacea*), Connecticut, Maine, Massachusetts.

*Elymus canadensis glaucifolius*, Wisconsin.

*Elymus robustus*, Utah.

*Elymus virginicus*, Illinois.

*Festuca nutans*, District of Columbia.

*Phleum pratense*, California, Illinois, Indiana, Iowa, Kansas, Massachusetts, Minnesota, Missouri, New Jersey, New York, Ohio, Utah, Wisconsin; Canada.

*Poa annua*, Massachusetts.

*Poa debilis*, Wisconsin.

*Poa pratensis*, Delaware, Illinois, Iowa, Ohio, Washington.

*Sitanion longifolium*, California.

Unknown grass, Massachusetts, New Jersey, New York, Texas, Washington.

TYPE LOCALITY: Courtrai, Belgium, on *Holcus lanatus*.

DISTRIBUTION: New England to Texas, California and Washington; Canada; also in Europe.

ILLUSTRATIONS: Bull. Ill. Agr. Exp. Sta. 57: *pl. Q, R 4, S 6-7*; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 51*; Bull. Iowa Agr. Exp. Sta. 54: *f. 120 (2), 122*; Jahrb. Wiss. Bot. 7: *pl. 7, f. 2-4, pl. 9, f. 14-16*.

EXSICCATI: Seym. & Earle, Econ. Fungi 76, 77, C 89, C 90, C 91, C 148; Ellis & Ev. Fungi Columb. 1370; Ellis, N. Am. Fungi 1498; Underw. & Cook, Illust. Fungi 58.

54. *Ustilago Calamagrostidis* (Fuckel) Clinton, Jour. Myc. 8: 138. 1902.

*Tilletia Calamagrostis* Fuckel, Symb. Myc. 40. 1869.

Sori in leaves, more rarely also in axis of inflorescence and even in spikelets, generally showing as linear striae, distinct or often more or less confluent, at first covered by epidermis, upon rupture disclosing dusty brown-black lines of spores; spores medium to dark reddish-brown, rather irregularly oblong to spherical, usually angular, prominently verrucose, 13-20  $\mu$  in length.

ON POACEAE:

*Calamagrostis breviseta* (*C. Pickeringii*), New York.

*Calamagrostis canadensis*, Vermont.

*Calamagrostis canadensis acuminata*, Wyoming.

TYPE LOCALITY: Europe, on *Calamagrostis epigeios*.

DISTRIBUTION: Vermont, New York and Wyoming; also in Europe.

EXSICCATI: Griff. West Am. Fungi 228.

55. *Ustilago macrospora* Desmaz. Pl. Crypt. II. 1727. 1850.

*Tilletia serpens* Karst. Fung. Fenn. 599. 1866.

*Tilletia aculeata* Ule, Abh. Bot. Ver. Prov. Brand. 25: 213. 1884. (Type from Berlin, Germany, on *Agropyron repens*.)

Sori in leaves and glumes, generally showing as linear striae, but often more or less merged, at first covered by epidermis, but this rupturing and disclosing black-brown dusty lines of spores; spores medium to dark reddish-brown, chiefly ovoid to spherical or occasionally somewhat irregular and more elongate, coarsely verrucose, at circumference usually showing the projections as tinted blunt scale-like appendages, sometimes even semi-reticulate, 12-19  $\mu$  in length.

ON POACEAE:

*Agropyron repens*, Iowa, Massachusetts, Wisconsin.

*Agropyron spicatum*, Oregon.

*Agropyron spicatum inerme*, Washington.

*Agropyron* sp., Utah.

*Elymus* sp., Utah.

TYPE LOCALITY: France, on *Bromus pinnatus*.

DISTRIBUTION: Massachusetts to Washington and Utah; also in Europe.

EXSICCATI: Ellis, Ev. & Barth. Fungi Columb. 1900; Seym. & Earle, Econ. Fungi C 141.

56. *Ustilago echinata* Schröt. Abh. Schles. Ges. Abth. Nat. Med.  
1869-72 : 4. 1870.

*Ustilago verrucosa* Vesterg. Jahreskat. Wiener Krypt. Tausch. 3. 1897. (Type from Sweden, on *Baldingera arundinacea*.) Not *U. verrucosa* Schröt. 1896.

*Ustilago Vestergreni* Sacc. & Sydow; Sacc. Syll. Fung. 14: 413. 1899.

Sori in leaf-blades and sheaths, forming conspicuous elongate striae often running greater length of leaf, upon rupture forming dusty or semi-agglutinated brown-black spore-lines; spores rather dark reddish-brown, ovoid to spherical, provided with conspicuous irregular scale-like tubercles which are rarely semi-anastomotic, chiefly 14-17  $\mu$ , the most elongate rarely 19  $\mu$ , in length.

ON POACEAE:

*Phalaris arundinacea*, Nebraska, Washington.

TYPE LOCALITY: Silesia, Europe, on *Phalaris arundinacea*.

DISTRIBUTION: Nebraska and Washington; also in Europe.

57. *Ustilago Arthurii* Hume, Proc. Iowa Acad. Sci. 9: 233. 1902.

*Ustilago Scolochloae* Griff. Bull. Torrey Club 31: 86. 1904. (Type from Oregon, on *Scolochloa festuacea*.)

Sori in the enfolded leaves, forming linear striae chiefly on their inner surface, which soon become obliterated by the dusty reddish-brown stratum of spores filling the interior; spores olive-brown, rather regular, chiefly subspherical or spherical, abundantly covered with conspicuous tubercles or scales, rarely very slightly anastomosing, 12.5-16  $\mu$  in length.

ON POACEAE:

*Panicularia americana* (*Glyceria grandis*), Iowa.

*Scolochloa festuacea*, Oregon.

TYPE LOCALITY: Spirit Lake, Iowa, on *Panicularia americana*.

DISTRIBUTION: Iowa and Oregon.

ILLUSTRATION: Bull. Torrey Club 31: 85, f. 4.

EXSICCATI: Seym. & Earle, Econ. Fungi C 135.

58. *Ustilago Heufleri* Fuckel, Symb. Myc. 39. 1869.

*Ustilago Erythronii* G. W. Clinton; Peck, Bull. Buffalo Soc. Nat. Sci. 1: 67. 1873. (Type from New York, on *Erythronium americanum*.)

*Ustilago Tulipae* Wint. in Rab. Krypt. Fl. 11: 86. 1881.

*Ustilago Ornithogali* f. *Erythronii* De-Toni; Sacc. Syll. Fung. 72: 452. 1888.

Sori in leaves, forming conspicuous rounded or often elongate pustules, covered by a thin whitish membrane which upon rupture discloses a somewhat dusty black spore-mass; spores dark reddish-brown, ovoid or ovate to spherical, usually regular, thick-walled, smooth but inner wall provided with more or less evident projections extending into outer lighter-colored part, 13-22  $\mu$  in length.

ON LILIACEAE:

*Erythronium americanum*, Missouri, New Jersey, New York, Pennsylvania.

TYPE LOCALITY: Vienna, Austria, on *Tulipa sylvestris*.

DISTRIBUTION: New York to Missouri; also in Europe.

ILLUSTRATION: Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 29.

EXSICCATI: Shear, N. Y. Fungi 83; Ellis, N. Am. Fungi 1095; Ellis & Ev. Fungi Columb. 471; Rab. Fungi Eur. 4207.

59. *Ustilago Vaillantii* Tul. Ann. Sci. Nat. III. 7: 90. 1847.

Sori in anthers and other essential organs, filling the floral envelopes with a dusty dark-olive mass; spores variable, golden-brown, ellipsoidal to spherical, smooth, but inner wall apparently obscurely echinulate, chiefly 7-12  $\mu$  in length.

ON LILIACEAE:

*Scilla praecox* (cult.), Massachusetts.

TYPE LOCALITY: Europe, on *Muscari comosum*.

DISTRIBUTION: Massachusetts; also in Europe.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 3, f. 15-19; Brefeld, Unters. Gesammt. Myk. 12: pl. 6, f. 32-38; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 10; Schröt. Beitr. Biol. Pfl. 2: pl. 12, f. 4.

60. *Ustilago Oxalidis* Ellis & Tracy, Jour. Myc. 6: 77. 1890.

Sori in the seeds, inconspicuous (affected ovaries scarcely differing from the normal except on dehiscence showing more or less of the seeds changed into reddish-brown dusty



spore-masses slightly larger than the uninfected seeds); spores golden-yellow, chiefly ovoid to spherical, occasionally more elongate or irregular, coarsely verrucose, 13–20  $\mu$  in length; conidia produced in anthers, inconspicuous, ovoid to subspherical, hyaline, thin-walled.

ON OXALIDACEAE:

*Oxalis stricta*, Connecticut, Illinois, Iowa, Kansas, Mississippi, Missouri, New York, Wisconsin.

TYPE LOCALITY: Starkville, Mississippi, on *Oxalis stricta*.

DISTRIBUTION: Connecticut to Wisconsin, Kansas and Mississippi; also in South America.

ILLUSTRATION: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 3, 48.

EXSICCATI: Ellis & Ev. N. Am. Fungi 2424; Ellis & Ev. Fungi Columb. 470; Rab.-Wint.-Paz. Fungi Eur. 4007; Seym. & Earle, Econ. Fungi C 79, C 80.

61. *Ustilago vinosa* (Berk.) Tul. Ann. Sci. Nat. III. 7: 96. 1847.

*Uredo vinosa* Berk.; Tul. loc. cit., as synonym.

Sori in the essential organs, forming purplish dusty spore-masses usually enwrapped as a somewhat swollen body by the perianth; spores very pale-violet, ovoid to spherical or occasionally slightly irregular, thick-walled, ridged with very small reticulations (1  $\mu$  or less in diameter), chiefly 7–10  $\mu$  in length.

ON POLYGONACEAE:

*Oxyria digyna*, California, Washington; Alaska; Greenland.

*Oxyria* sp., Wyoming.

TYPE LOCALITY: Scotland, on *Oxyria reniformis*.

DISTRIBUTION: Greenland, Wyoming, California, Washington and Alaska; also in Europe.

ILLUSTRATION: Brefeld, Unters. Gesamt. Myk. 12: pl. 8, f. 13–15.

62. *Ustilago violacea* (Pers.) Fuckel, Jahrb. Ver. Nat. Nass. 15: 21. 1861.

*Uredo violacea* Pers. Tent. Disp. Fung. 57. 1797.

*Ustilago antherarum* Fries, Syst. Myc. 3: 518. 1832.

Sori inconspicuous, filling swollen anthers, soon rupturing and disclosing violet-colored dusty mass of spores; spores pale-lilac to almost hyaline, ovoid to spherical, occasionally somewhat irregular, with rather conspicuous spore-wall covered with numerous minute reticulations (1  $\mu$  or less in diameter), chiefly 5.5–8.5  $\mu$  in length.

ON CARYOPHYLLACEAE:

*Alsine borealis* (*Stellaria borealis*), Greenland.

*Arenaria groenlandica*, Maine, New Hampshire, New York, Vermont.

*Cerastium maximum*, Alaska.

*Lychnis* sp., Minnesota.

*Moehringia lateriflora* (*Arenaria lateriflora*), Minnesota, Wisconsin.

*Moehringia lateriflora glabrescens* (*Arenaria lateriflora glabrescens*), Washington.

*Silene acaulis*, New Hampshire.

*Silene Lyallii* (*S. Douglasii Macounii*), Montana.

*Silene multicaulis*, Washington.

*Silene telonensis*, Wyoming.

*Silene Watsoni*, California, Washington.

TYPE LOCALITY: Europe, on *Silene nutans*.

DISTRIBUTION: New England to California, Alaska, and Greenland; also in South America, Europe, Asia and Africa.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 4, f. 12–19, pl. 5, f. 23; Brefeld, Unters. Gesamt. Myk. 5: pl. 1; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 17; Jahrb. Wiss. Bot. 7: pl. 12, f. 1–26; Trans. Wisc. Acad. 12: pl. 8–9, f. 8–22.

*Ustilago violacea major* Clinton, Jour. Myc. 8: 139. 1902. Spores deeper violet and chiefly 7–12  $\mu$  in length. ON CARYOPHYLLACEAE: *Silene Watsoni*, Mt. Rainier, Washington.

63. *Ustilago Gayophyti* Hark. Bull. Calif. Acad. Sci. 1: 36. 1884.

Sori in seeds, upon dehiscence of ovary showing as small somewhat dusty purple-black masses; spores rather dark-purple, ovoid or ovate to spherical, provided with small reticulations (about 1  $\mu$  in depth and width), chiefly 12–18  $\mu$  in length.

ON ONAGRACEAE:

*Gayophytum caesium*, (Utah)

*Gayophytum lasiospermum*, Oregon.

*Gayophytum ramosissimum*, California, Oregon, (Utah)

TYPE LOCALITY: Summit, Placer County, California, on *Gayophytum ramosissimum*.

DISTRIBUTION: Utah, California and Oregon.

64. *Ustilago Calandriniae* Clinton, Proc. Bost. Soc.  
Nat. Hist. 31: 378. 1904.

Sori in the flowers, enclosed by the floral envelopes, about 3 or 4 mm. in diameter, forming a purplish-black dusty spore-mass; spores dark reddish-purple, ovoid to subspherical or spherical, regularly and rather minutely reticulately winged (with reticulations about 1.5–2  $\mu$  wide and 1–2  $\mu$  high), 13.5–17  $\mu$  in length.

ON PORTULACACEAE:

*Calandrinia Breweri*, California.

*Calandrinia Menziesii*, California.

TYPE LOCALITY: Santa Barbara, California, on *Calandrinia Breweri*.

DISTRIBUTION: California.

65. *Ustilago anomala* J. Kunze (Fungi Sel. Exs. 23; hyponym. 1877);  
Wint. in Rab. Krypt. Fl. 1<sup>1</sup>: 100. 1881.

*Ustilago pallida* Schröt.; Fisch. de Waldh. Aperçu Syst. Ust. 30. My 1877. (Type from Germany, on *Polygonum Convolvulus*.) Not *U. pallida* Körn. Mr 1877.

Sori in ovaries or essential organs, the infected parts often remaining distinct; 2–3 mm. in length, protected by the perianth, forming a dusty purplish spore-mass; spores light-violet, chiefly ovoid to spherical or occasionally somewhat irregular, with rather fine reticulations (chiefly 1–3  $\mu$  wide by 1  $\mu$  deep), 10–15  $\mu$ , rarely 17  $\mu$ , in length.

ON POLYGONACEAE:

*Tiniaria cilinodis* (*Polygonum cilinode*), Maine, New Hampshire, New York, Vermont.

*Tiniaria Convolvulus* (*Polygonum Convolvulus*), Illinois.

*Tiniaria scandens* (*Polygonum scandens*, *P. dumetorum scandens*), Connecticut, Delaware, Indiana, Missouri, Vermont, West Virginia.

TYPE LOCALITY: Saxony, on *Polygonum dumetorum* (*Tiniaria dumetorum*).

DISTRIBUTION: New England to Delaware and Missouri; also in Europe.

ILLUSTRATION: Brefeld, Unters. Gesammt. Myk. 12: pl. 8, f. 10–12.

EXSICCATI: Ellis, N. Am. Fungi 1094; Seym. & Earle, Econ. Fungi 364, C 63, C 134.

66. *Ustilago utriculosa* (Nees) Tul. Ann. Sci. Nat. III. 7: 102. 1847.

*Caeoma utriculosum* Nees, Syst. Pilze 1: 14. 1817.

Sori in ovaries and probably in stamens, protected by floral envelopes, ovate, about 3–4 mm. in length, forming a dusty purplish spore-mass; spores violet, chiefly subspherical or spherical, with prominent winged reticulations (2–4  $\mu$  wide by about 1.5  $\mu$  deep), chiefly 9–14  $\mu$  in diameter.

ON POLYGONACEAE:

*Persicaria amphibia* (*Polygonum amphibia*), Indiana, Pennsylvania.

*Persicaria Carey* (*Polygonum Carey*), Maine.

*Persicaria Hydropiper* (*Polygonum Hydropiper*), Alabama, Connecticut, Iowa.

*Persicaria hydropiperoides* (*Polygonum hydropiperoides*), Connecticut, Mississippi, Vermont, Wisconsin.

*Persicaria incarnata* (*Polygonum incarnatum*, *P. lapathifolium incarnatum*), Illinois, Iowa.

*Persicaria lapathifolia* (*Polygonum lapathifolium*), Connecticut, District of Columbia, Illinois.

*Persicaria pennsylvanica* (*Polygonum pennsylvanicum*), Alabama, Connecticut, Delaware, Illinois, Iowa, Kansas, Massachusetts, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, Ohio, Rhode Island, Vermont, West Virginia.

*Persicaria punctata* (*Polygonum punctatum*, *P. acre*), Illinois, Kansas, Mississippi.

*Persicaria* (*Polygonum*) sp., Illinois, Massachusetts, Michigan, Missouri, New Jersey, North Carolina, Rhode Island, Washington; Mexico.

*Polygonum aviculare*, California.

*Polygonum erectum*, Mississippi.

? *Tracaulon sagittatum* (*Polygonum sagittatum*), New York.

TYPE LOCALITY: Europe, on *Polygonum* sp.

DISTRIBUTION: New England to Alabama, Mexico, and Washington; also in South America, Europe, Asia, and Australia.

ILLUSTRATIONS: Nees, loc. cit. pl. 1, f. 6; Ann. Sci. Nat. III. 7: pl. 4, f. 2–6; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 4, 21, 54; Brefeld, Unters. Gesammt. Myk. 12: pl. 8, f. 42–48; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 19.

EXSICCATI: Ellis, N. Am. Fungi 288; Shear, N. Y. Fungi 84; Seym. & Earle, Econ. Fungi, 376 a–b, C 94, C 95, C 96, C 150; Rab.-Wint.-Paz. Fungi Eur. 3905; Ellis & Ev. Fungi Columb. 42, 1798, 2196; Sydow, Ust. 258.



67. *Ustilago Rumicis* (Berk.) Clinton, Proc. Bost. Soc.  
Nat. Hist. 31 : 380. 1904.

*Ustilago utriculosa Rumicis* Berk. Grevillea 3 : 59. 1874.

Sori in flowers of the inflorescence and involving the floral axes as well, forming purplish dusty spore-masses; spores medium- to rather dark-purple, chiefly ovoid to spherical, with more or less prominently winged reticulations (chiefly  $1\ \mu$  deep by  $1-3\ \mu$  wide), mostly  $11-16\ \mu$  in length.

ON POLYGONACEAE:

*Rumex Acetosella*, South Carolina.

*Rumex hastatulus*, Alabama.

TYPE LOCALITY: Santee Canal, South Carolina, on *Rumex Acetosella*.

DISTRIBUTION: South Carolina and Alabama.

68. *Ustilago Parlatorei* Fisch. de Waldh. Hedwigia 15 : 177. 1876.

Sori in stems, petioles and midribs, often extensive and causing more or less distortion and swelling of infected parts, upon rupture of enclosing tissues disclosing dark-violet dusty spore-mass; spores violet, often with reddish tinge, ovoid to chiefly subspherical or spherical though rarely more irregular or elongate, with numerous rather regular reticulations (about  $2\ \mu$  wide and  $1-2\ \mu$  deep), chiefly  $12-16\ \mu$  in length.

ON POLYGONACEAE:

*Rumex altissimus*, Illinois.

*Rumex Britannica*, Missouri, Nebraska.

*Rumex mexicanus*, Mexico.

TYPE LOCALITY: Near Moscow, Russia, on *Rumex maritimus*.

DISTRIBUTION: Illinois, Missouri, Nebraska, and Mexico; also in South America and Europe.

EXSICCATI: Ellis & Ev. N. Am. Fungi 2701; Rab.-Wint.-Paz. Fungi Eur. 4009; Sydow, Ust. 112.

69. *Ustilago Koenigiae* Rostr. Medd. Grønland 3 : 532. 1888.

Sori on stems and sometimes on leaves, forming subspherical to linear pustules, upon rupture disclosing somewhat dusty purplish spore-mass; spores very light-violet, irregular, oblong to spherical, apparently smooth but under an immersion lens showing very minute oblique striae, chiefly  $6-9\ \mu$ , the most elongate rarely  $12\ \mu$ , in length.

ON POLYGONACEAE:

*Macounastrum islandicum* (*Koenigia islandica*), Greenland.

TYPE LOCALITY: Greenland, on *Koenigia islandica* (*Macounastrum islandicum*).

DISTRIBUTION: Known only from the type locality.

70. *Ustilago Piperii* Clinton, Proc. Bost. Soc. Nat. Hist. 31 : 382. 1904.

Sori forming pustules on under side of leaves, several mm. in diameter though usually more or less completely confluent, often confined to the margin, upon rupture of thin covering membrane showing dusty dark-purple spore-mass; spores reddish-purple, ovate or ovoid to chiefly subspherical or spherical, occasionally more irregular, minutely and usually obliquely striate, chiefly  $7-10\ \mu$ , or irregular ones occasionally  $12\ \mu$ , in length.

ON POLYGONACEAE:

*Polygonum Davisiae*, California.

*Polygonum phytolaccaefolium*, Idaho.

TYPE LOCALITY: Bald Mountain, Bitter Root Mountains, Shoshone County, Idaho, on *Polygonum phytolaccaefolium*.

DISTRIBUTION: Idaho and California.

71. *Ustilago punctata* Clinton, sp. nov.

Sori in the inflorescence more or less involving the whole or confined to the individual flowers and enwrapped by the floral envelopes, rarely developing pustules on the floral leaves, forming a black-purple dusty spore-mass; spores dark-purple (immature ones often hyaline or tinted), rather irregular, often adhering together somewhat, ovoid to subspherical or not infrequently flattened and irregularly elongate, appearing smooth but under high powers or an immersion lens usually showing very minutely punctate-reticulate, chiefly  $13-17\ \mu$ , the most elongate rarely  $19\ \mu$ , in length.

## ON POLYGONACEAE:

*Polygonum Newberryi*, Washington.

Type collected on *Polygonum Newberryi*, Mt. Paddo, Washington, at an altitude of about 2200 m., by W. N. Suksdorf, September, 1904. Its distinguishing character is the punctate-reticulations of the spores that require very high powers for their detection.

72. *Ustilago Bistortarum* (DC.) Körn. Hedwigia 16: 38. 1877.

*Uredo Bistortarum* DC. Fl. Fr. 6: 76. 1815.

*Uredo Bistortarum pustulata* DC. Fl. Fr. 6: 76. 1815.

*Uredo Bistortarum marginalis* DC. Fl. Fr. 6: 76. 1815.

*Tilletia bullata* Fuckel, Symb. Myc. 40. 1869.

Sori in leaves, either in pustules 2-5 mm. in diameter scattered over the surface or in a continuous line closely following the margin, purplish, rupturing usually only on one side of leaf; spores light- to dark-purple, ovoid or ovate to usually chiefly subspherical or spherical, occasionally somewhat angled or irregularly elongate, thick-walled, granular to minutely verruculose, chiefly 13-17  $\mu$ , the most elongate rarely 19  $\mu$  or even 22  $\mu$ , in length.

## ON POLYGONACEAE:

*Bistorta bistortoides* (*Polygonum bistortoides*), Washington.

*Bistorta vivipara* (*Polygonum viviparum*), Colorado, Wyoming; Alaska; Greenland.

TYPE LOCALITY: Alps and Pyrenees, Europe, on *Polygonum Bistorta* (*Bistorta major*).

DISTRIBUTION: Colorado to Alaska and Greenland; also in Europe.

ILLUSTRATIONS: E. & P. Nat. Pfl. 11\*\* : 11, f. 7 E; Brefeld, Unters. Gesamt. Myk. 12: pl. 8, f. 31-34.

EXSICCATI: Rab.-Wint. Fungi Eur. 3502.

*Ustilago Bistortarum inflorescentiae* Trel. Harriman Alaska Exp. Crypt. Bot. 35. 1904. Sori in the flowers, infecting all, enwrapped by floral envelopes, forming a dusty dark-purple spore-mass; spores chiefly dark-purple when mature, rather irregular, ovoid to spherical, often angled or somewhat flattened, often apparently smooth but minutely granular verruculose, chiefly 10-14  $\mu$ , the most elongate rarely even 17  $\mu$ , in length. ON POLYGONACEAE: *Bistorta vivipara* (*Polygonum viviparum*), Wyoming; Alaska; Greenland. EXSICCATI: Griff. West Am. Fungi 223.

Rostrup reported this variety from Greenland and Griffiths from Wyoming as *Sphacelotheca Hydropiperis*. It has close resemblance to that species.

## DOUBTFUL AND EXCLUDED SPECIES

*Sporophaga cyanea* (Ces.) Hark. Proc. Calif. Acad. Sci. III. Bot. 1: 281. 1899. (*Ustilago cyanea* Ces.; Hark. loc. cit. as a synonym.) = ? Chytridinales.

*Ustilago Arenariae* Ellis & Ev. Bull. Torrey Club 22: 362. 1895. On *Arenaria congesta*. Extraneous spores.

*Ustilago Ficuum* Reichardt, Verh. Zool.-Bot. Ges. Wien 17: 335. 1867. On market figs, *Ficus Carica*. = *Sterigmatocystis*.

*Ustilago Fischeri* Pass. Bull. Agr. Com. Parm. N 1877. On *Zea Mays*. = *Sterigmatocystis*.

*Ustilago flavo-nigrescens* B. & C. Jour. Linn. Soc. 10: 358. 1868. On *Scleria* sp. Sclerotium of *Ustilaginoidea*.

*Ustilago Gynerii* Vize, Grevillea 5: 110. 1877. On *Gynerium argenteum*. = *Gymnosporium*.

*Ustilago Osmundae* Peck, Bot. Gaz. 6: 276. 1881. On *Osmunda regalis*. ? Hyphomycete.

*Ustilago Phoenicis* Corda, Ic. Fung. 4: 9. 1840. On market dates, *Phoenix dactylifera*. = *Sterigmatocystis*.

*Ustilago strumosa* Cooke, Grevillea 9: 98. 1881. On *Chusquea abietifolia*. Sclerotium of *Ustilaginoidea*.

*Ustilago viridis* Ellis & Ev. Jour. Myc. 3: 56. 1887. On *Setaria* sp. Sclerotium of *Ustilaginoidea*.

2. *SPHACELOTHECA* DeBary, Verg. Morph. Biol. Pilze 187. 1884.

*Sporisorium* Ehrenb.; Link, in Willd. Sp. Pl. 62: 86. 1825.

*Endothlaspis* Sor. Rev. Myc. 12: 4. 1890.

Sori usually in the inflorescence, often limited to the ovaries, provided with a definite (more or less temporary) false membrane covering a dusty spore-mass and a central columella (usually chiefly of plant tissues); false membrane composed largely or entirely of definite sterile fungous cells which are hyaline or slightly tinted, oblong to spherical, and usually more or less firmly bound together; spores single, usually reddish-brown, de-



veloped in a somewhat centripetal manner as in *Cintractia*, small to medium in size; germination as in *Ustilago*.

Type, *Uredo Hydropiperis* Schum.

Spores olive- or reddish-brown.

Sori in ovaries. (Often at base of spike in no. 4.)

Spores 5–8  $\mu$  in length, smooth.

Spores chiefly 8–12  $\mu$  in length.

Spores apparently smooth.

Sori linear.

Host: *Andropogon*.

Host: *Sorghastrum* (*Chrysopogon*).

Sori oblong to ovate.

Spores minutely verruculose.

Host: *Heteropogon* (*Andropogon*).

Host: *Echinochloa*, *Syntherisma*, *Panicum*.

Host: *Chaetochloa* (*Setaria*).

Spores chiefly 12–17  $\mu$  in length.

Sori involving or aborting the entire inflorescence.

Sori linear to oblong.

Sori 10–30 mm. in length.

Spores 7–10  $\mu$  in length.

Spores 12–15  $\mu$  in length.

Host: *Muhlenbergia*.

Host: *Eragrostis*.

Sori 40–150 mm. in length.

Spores 6–8  $\mu$  in length.

Spores 7–10  $\mu$  in length.

Spores 9–13  $\mu$  in length.

Sori forming very prominent irregular masses.

Spores lilac-tinted to purplish, 8–17  $\mu$  in length.

1. *S. Sorghi*.

2. *S. Seymouriana*.

3. *S. Chrysopogonis*.

4. *S. Nealii*.

5. *S. monilifera*.

6. *S. diplospora*.

7. *S. pamparum*.

8. *S. occidentalis*.

9. *S. Ischaemi*.

13. *S. montaniensis*.

14. *S. strangulans*.

11. *S. Panici-leucophaei*.

10. *S. Paspali-notati*.

12. *S. Andropogonis-hirtifolii*.

15. *S. Reiliana*.

16. *S. Hydropiperis*.

## 1. *Sphacelotheca Sorghi* (Link) Clinton, Jour. Myc. 8 : 140. 1902.

*Sporisorium Sorghi* Link, in Willd. Sp. Pl. 6<sup>2</sup> : 86. 1825.

*Tilletia Sorghi-vulgaris* Tul. Ann. Sci. Nat. III. 7 : 116. 1847.

*Ustilago Sorghi* Pass. ; Thüm. Hedwigia 12 : 114. 1873.

*Ustilago Tulasnei* Kühn, Ber. Sitz. Nat. Ges. Halle 1874 : 5. 1874.

*Cintractia Sorghi-vulgaris* Clinton, Bull. Ill. Agr. Exp. Sta. 47 : 404. 1897.

Sori usually in the ovaries or the essential organs, forming oblong to ovate bodies 3–12 mm. in length, rarely fusing the very young spikelets into irregular forms, protected for some time by a false membrane but upon rupture the olive-brown spore-mass becoming scattered, leaving naked the distinct columella of plant tissue; sterile cells of membrane breaking up somewhat into groups, hyaline, oblong to subspherical, chiefly 7–18  $\mu$  in length; spores subspherical to spherical, smooth, contents often granular, 5.5–8.5  $\mu$  in diameter.

ON POACEAE :

*Sorghum halepense*, Cuba.

*Sorghum vulgare*, Alabama, California, Connecticut, District of Columbia, Illinois, Iowa, Kansas, Nebraska, New Jersey, New York, Ohio, Oklahoma, South Dakota, Wisconsin; Ontario; Jamaica; Cuba.

TYPE LOCALITY : Egypt, on *Sorghum vulgare*.

DISTRIBUTION : New England and Ontario to California, Alabama, Jamaica and Cuba; also in Europe, Asia and Africa.

ILLUSTRATIONS : Ann. Sci. Nat. III. 7 : pl. 5, f. 17–22; Trans. Acad. Sci. St. Louis 7 : pl. 25, f. 1–5; Bull. Ill. Agr. Exp. Sta. 47 : pl. 1–5; 57 : pl. E, M, N, R 1, U; Bull. Conn. Geol. Nat. Hist. Surv. 5 : f. 5, 24, 26, 38; E. & P. Nat. Pfl. 11<sup>\*\*</sup> : 9, f. 5, D, E; Flora 83 : pl. 3, f. 8; Brefeld, Unters. Gesammt. Myk. 12 : pl. 7, f. 19–22; Bull. Kan. Agr. Exp. Sta. 23 : pl. 2; Bull. Soc. Bot. France 42 : 37, f. a–e.

EXSICCATI : Kellerm. Ohio Fungi 4–7; Ellis, N. Am. Fungi 1496; Ellis & Ev. Fungi Columb. 982, 1483; Seym. & Earle, Econ. Fungi 545, C 46, C 47, C 48; Sydow, Ust. 117; Griff. West Am. Fungi 213.

## 2. *Sphacelotheca Seymouriana* Clinton, Proc. Bost. Soc. Nat. Hist.

31 : 387. 1904.

Sori in ovaries, forming linear bodies 4–7 mm. long, or about the length of the glumes between which they extend, rupturing from apex and disclosing a distinct columella and somewhat agglutinate spore-mass; sterile cells hyaline, with those of the interior often in groups, chiefly subspherical, with those forming the membrane more irregular and adhering more permanently, about the size of the spores; spores light-brown, often with pitted con-

tents, apparently smooth, chiefly subspherical or slightly polyhedral, occasionally ovate or ovoid, 7-12  $\mu$  in length.

ON POACEAE:

*Andropogon virginicus*, Alabama, North Carolina.

*Andropogon* sp., Georgia.

TYPE LOCALITY: Auburn, Alabama, on *Andropogon virginicus*.

DISTRIBUTION: North Carolina, Georgia and Alabama.

EXSICCATI: Sydow, Ust. 189; Seym. & Earle, Econ. Fungi 531, C 122.

3. *Sphacelotheca Chrysopogonis* Clinton, Proc. Bost. Soc.

Nat. Hist. 31: 387. 1904.

Sori usually in all the ovaries of the panicle, linear-oblong, about 3-5 mm. in length, showing between the spreading glumes, with sterile membranes as well as the semi-agglutinated black-brown spore-mass gradually wearing away, leaving behind the small but evident columella; sterile cells hyaline, often separating into groups, subspherical, averaging slightly larger than the spores; spores reddish-brown, ovoid to chiefly subspherical, occasionally angled, often with punctate contents, apparently smooth, chiefly 8-11  $\mu$  in length.

ON POACEAE:

*Sorghastrum nutans* (*Chrysopogon nutans*), Mexico.

TYPE LOCALITY: Chapala, Mexico, on *Chrysopogon nutans* (*Sorghastrum nutans*).

DISTRIBUTION: Mexico.

EXSICCATI: Seym. & Earle, Econ. Fungi C 118.

4. *Sphacelotheca Nealii* (Ellis & And.) Clinton, Proc. Bost.

Soc. Nat. Hist. 31: 389. 1904.

*Ustilago Nealii* Ellis & And. Jour. Myc. 6: 116. 1891.

Sori in the ovaries or spikelets, 0.5-2 cm. in length, oblong to ovate, often forming conspicuous nodules at basal part of spike, with evident tough whitish false membrane rupturing from apex and disclosing a black-brown semi-agglutinated spore-mass and a more or less evident columella; sterile cells hyaline, often adhering in groups, usually subspherical and larger than spores; spores reddish-brown, ovoid to chiefly subspherical, often angular, usually smooth, chiefly 7-11  $\mu$  in length.

ON POACEAE:

*Heteropogon melanocarpus* (*H. acuminatus*), Florida; Mexico.

TYPE LOCALITY: Lake City, Florida, on *Heteropogon melanocarpus*.

DISTRIBUTION: Florida and Mexico (Chapala and Guadalajara).

EXSICCATI: Seym. & Earle, Econ. Fungi C 119, C 120.

5. *Sphacelotheca monilifera* (Ellis & Ev.) Clinton, Jour.

Myc. 8: 141. 1902.

*Ustilago monilifera* Ellis & Ev. Bull. Torrey Club 22: 362. 1895.

*Ustilago Andropogonis-contorti* P. Henn.; Clinton, Jour. Myc. 8: 141, as a synonym. 1902.

Sori in ovaries of the spikelets, elongate, 4-7 mm. or about the length of the glumes and often completely concealed by them, with evident false membrane that ruptures into irregular lobes and discloses a brown-black spore-mass, with evident columella; cells of false membrane adhering rather permanently, with those of the interior in loose subspherical groups, hyaline or slightly tinted, chiefly subspherical, about the diameter of the spores; spores reddish-brown, chiefly ovoid to spherical or somewhat angled, rather minutely verruculose or echinulate, 9-13  $\mu$  in length.

ON POACEAE:

*Heteropogon contortus* (*Andropogon contortus*), Arizona; Mexico.

TYPE LOCALITY: Tucson, Arizona, on *Heteropogon contortus*.

DISTRIBUTION: Arizona and Mexico; also in Hawaii.

EXSICCATI: Griff. West Am. Fungi 215.

6. *Sphacelotheca diplospora* (Ellis & Ev.) Clinton, Jour.

Myc. 8: 140. 1902.

*Ustilago diplospora* Ellis & Ev. Jour. Myc. 6: 119. 1891.

Sori in the ovaries of only part of the spikelets, rather inconspicuous, showing between the spreading glumes which they rarely exceed in length, with evident false membrane that



soon ruptures and discloses an olive-black dusty spore-mass; false membrane easily separated into hyaline or slightly tinted generally subspherical cells which are also somewhat scattered in the spore-mass and are slightly larger than the spores; spores often mechanically adhering in irregular masses, reddish-brown, occasionally ovoid but chiefly subspherical or polyhedral, abundantly but minutely verruculose, 8–12  $\mu$  in length.

ON POACEAE:

*Echinochloa Crus-galli* (*Panicum Crus-galli*), Illinois.

*Syntherisma sanguinale* (*P. sanguinale*), Mississippi.

TYPE LOCALITY: Holly Springs, Mississippi, on *Panicum sanguinale* (*Syntherisma sanguinale*).

DISTRIBUTION: Illinois and Mississippi.

**Sphacelotheca diplospora verruculosa** Clinton, var. nov. Sori apparently in all of the ovaries of the inflorescence, with rather firm false membrane of oblong to cuboidal or rarely subspherical cells; spores evidently verruculose, 9.5–13  $\mu$  in length. ON POACEAE: *Panicum* sp., Mexico. Type collected at Lecheria, near City of Mexico, July, 1904, by C. G. Pringle, and communicated by E. W. D. Holway. Differs especially from the species in the larger more evidently verruculose spores.

**Sphacelotheca diplospora glabra** Clinton & Ricker, var. nov. Sori apparently in all of the ovaries of the inflorescence; spores slightly tinted to reddish-brown, apparently smooth (under an immersion rarely some of the darker-colored obscurely verruculose), 8–11  $\mu$  in length. ON POACEAE: *Panicum rothboellioides*, Cuba. Type collected at Herradura, Cuba, March 16, 1906, by A. S. Hitchcock. Differs from the species in the lighter-colored, smoother spores.

## 7. *Sphacelotheca pamparum* (Speg.) Clinton, Jour. Myc. 8: 140. 1902.

*Ustilago Setariae* "Niessl?", Speg. Anal. Soc. Ci. Argent. 10: 5. 1880. Not *U. Setariae* Niessl.

*Ustilago pamparum* Speg. Anal. Soc. Ci. Argent. 17: 89. 1884.

*Ustilago Kolaczekii* Kühn; Rab.-Wint. Fungi Eur. 3401. 1886.

Sori infecting all of the ovaries of the spike, extending between the glumes as oblong bodies about 3–7 mm. in length, with evident false membrane which ruptures irregularly from apex into several elongate lobes and discloses a somewhat dusty, olive-black spore-mass and an evident columella; cells of false membrane chiefly hyaline, oblong to subspherical, adhering together rather permanently, chiefly smaller than the spores; spores reddish-brown, ovoid to spherical but chiefly polyhedral through pressure, minutely verruculose, 9–12  $\mu$ , rarely 14  $\mu$ , in length.

ON POACEAE:

*Chaetochloa imberbis* (*Setaria imberbis*), Cuba.

*Chaetochloa* (*Setaria*) sp., Mexico.

TYPE LOCALITY: Argentina, on *Setaria glauca* (*Chaetochloa glauca*).

DISTRIBUTION: Mexico; Cuba; also in South America and Europe.

EXSICCATI: Sydow, Ust. 162.

## 8. *Sphacelotheca occidentalis* (Seym.) Clinton, Jour. Myc. 8: 141. 1902.

*Sorosporium Ellisii occidentalis* Seym.; Ell. & Ev. N. Am. Fungi 2265. F 1889.

*Ustilago Andropogonis* Kellerm. & Swingle, Jour. Myc. 5: 12. Mr 1889. (Type from Kansas, on *Andropogon furcatus*.)

Sori in the ovaries linear, usually 0.5–1 cm. or rarely longer, with prominent false membrane dehiscing from apex, with rather prominent columella and agglutinate or finally dusty black-brown spore-mass; sterile cells of membrane hyaline, variable in shape and size, adhering together rather firmly, often somewhat obscured through semi-gelatinization but the loose groups of the interior composed of more regular subspherical cells; spores often adhering together mechanically but not in spore-balls, reddish-brown, ovoid to spherical, usually somewhat angled, often more elongate and irregular, verruculose, chiefly 12–17  $\mu$ , irregular elongate forms sometimes even 20  $\mu$ , in length.

ON POACEAE:

*Andropogon furcatus*, Kansas, Nebraska, North Dakota.

*Andropogon glomeratus* (*A. macrourus*), California.

*Andropogon Hallii*, Illinois (cult.), Kansas, Nebraska.

TYPE LOCALITY: Bismark, North Dakota, on *Andropogon furcatus*.

DISTRIBUTION: Illinois (on cultivated plants); North Dakota to Kansas and California.

ILLUSTRATIONS: Jour. Myc. 5: pl. 1, f. 12–25; Trans. Acad. Sci. St. Louis 7: pl. 26, f. 14–17;

Bull. Iowa Agr. Exp. Sta. 54: f. 120 (11).

EXSICCATI: Ellis & Ev. N. Am. Fungi 2265, 2422; Ellis & Ev. Fungi Columb. 538.

## 9. *Sphacelotheca Ischaemi* (Fuckel) Clinton, Jour. Myc. 8: 140. 1902.

*Ustilago Ischaemi* Fuckel, Jahrb. Ver. Nat. Nass. 15: 22. 1861.

*Ustilago cylindrica* Peck, Bot. Gaz. 7: 55. 1882. (Type from Arizona, on *Andropogon* sp.)

*Cintractia Ischaemi* Sydow, Oesterr. Bot. Zeits. 51: 12. 1901.



Sori often involving entire inflorescence, linear, usually enclosed by leaf-sheaths, about 10–30 mm. in length by 1–3 mm. wide, with false membrane soon rupturing and black-brown spore-mass becoming scattered, eventually leaving behind the naked columella; sterile cells besides forming false membrane also scattered through spore-mass in subspherical groups 25–40  $\mu$  in diameter, the individual cells being hyaline, subspherical, flattened where in contact, 7–18  $\mu$  in diameter; spores usually ovoid to spherical, smooth or sometimes very minutely granular, 7–10  $\mu$  in length.

ON POACEAE:

*Andropogon furcatus*, Kansas.

*Andropogon saccharoides*, Mexico.

*Andropogon Torreyanus*, Arizona, Texas.

*Andropogon* sp., Arizona.

*Heteropogon contortus* (*Andropogon contortus*), Arizona; Mexico.

*Schizachyrium scoparium* (*Andropogon scoparius*), Illinois.

TYPE LOCALITY: Biebrich, Germany, on *Andropogon Ischaemum*.

DISTRIBUTION: Kansas, Texas, Arizona, and Mexico; also in South America, Europe, Africa, and Asia.

ILLUSTRATIONS: Brefeld, Unters. Gesamt. Myk. 5: pl. 11, f. 1–2; Flora 83: pl. 3, f. 1–6; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 7.

EXSICCATI: Seym. & Earle, Econ. Fungi C 44: Ellis, Ev. & Barth. Fungi Columb. 1783; Griff. West Am. Fungi 216, 216<sup>a</sup>.

10. *Sphacelotheca Paspali-notati* (P. Henn.) Clinton, Jour. Myc.

8: 140. 1902.

*Ustilago Paspali-notati* P. Henn.; Clinton, loc. cit. as a synonym. 1902.

Sori in the inflorescence, linear, about 4–6 cm. in length, with evident false membrane gradually flaking away from apex and exposing reddish-brown dusty spore-mass surrounding evident often forked columella; sterile cells hyaline, with those of the membrane adhering rather firmly, with loose ones in roundish clusters, usually larger than the spores; spores light reddish-brown, ovoid to spherical or slightly angled, apparently smooth but very minutely verruculose, 7–10  $\mu$  in length.

ON POACEAE:

*Paspalum notatum*, Mexico.

TYPE LOCALITY: Guadalajara, Mexico, on *Paspalum notatum*.

DISTRIBUTION: Known only from the type locality.

EXSICCATI: Seym. & Earle, Econ. Fungi C 121.

11. *Sphacelotheca Panici-leucophaei* (Bref.) Clinton.

*Ustilago Panici-leucophaei* Bref. Unters. Gesamt. Myk. 12: 114. 1895.

*Ustilago insularis* P. Henn. Hedwigia 35: 51. 1896. (Type from Brazil, on *Tricholaena insularis*.)

Sori possibly involving the very young inflorescence but apparently chiefly in the enveloping leaves, projecting from between the leaf-sheaths as conspicuous linear bodies often 1.5 dm. in length, with the false whitish membrane flaking away, revealing the shredded longitudinal filaments of plant-tissue and the brown-black spore-mass which soon scatters; sterile cells of membrane hyaline, guttulate, separating on pressure into threads or individual cells, subspherical to oblong, 6–14  $\mu$  in length; spores reddish-brown, ovoid to chiefly subspherical or spherical, often slightly angled, easily collapsing, smooth or very minutely granular, chiefly 6–8  $\mu$  in length.

ON POACEAE:

*Trichachne insulare* (*Panicum leucophaeum*), Cuba; Guatemala; Jamaica; Mexico; Porto Rico.

*Trichachne saccharatum* (*Panicum saccharatum*), Arizona.

TYPE LOCALITY: Rio de Janeiro, Brazil, on *Panicum leucophaeum* (*Trichachne insulare*).

DISTRIBUTION: Arizona to Guatemala and Porto Rico; also in South America.

ILLUSTRATION: Brefeld, Unters. Gesamt. Myk. 12: pl. 6, f. 42.

EXSICCATI: Seym. & Earle, Econ. Fungi C 82.

12. *Sphacelotheca Andropogonis-hirtifolii* (P. Henn.) Clinton,

Jour. Myc. 8: 141. 1902.

*Ustilago Andropogonis-hirtifolii* P. Henn. Bot. Gaz. 28: 274. 1899.

*Ustilago Andropogonis-saccharoidis* P. Henn.; Sydow, Ust. 251; hyponym. 1901. (Type from Mexico, on *Andropogon saccharoides*.)

Sori involving the entire inflorescence, elongate, usually 5–9 cm. in length (rarely in the individual spikelets and then shorter), at first enveloped by the leaf-sheath, with promi-



nent false membrane that gradually flakes away disclosing the at first agglutinated but finally dusty olive-black spore-mass, with prominent often forked columella; sterile cells hyaline, with those of membrane adhering together rather firmly and those of interior in groups, chiefly subspherical, smaller to larger than the spores; spores reddish-brown, ovoid to chiefly subspherical or spherical, sometimes angled, often apparently smooth but really very minutely verruculose, 9–13  $\mu$  in length.

ON POACEAE:

*Andropogon hirtifolius pubiflorus*, Mexico.

*Andropogon saccharoides*, Arizona; Mexico.

TYPE LOCALITY: Patzcuaro, Michoacan, Mexico, on *Andropogon hirtifolius pubiflorus*.

DISTRIBUTION: Arizona and Mexico.

EXSICCATI: Sydow, Ust. 201, 251.

### 13. *Sphacelotheca montaniensis* (Ellis & Holway) Clinton,

Jour. Myc. 8: 141. 1902.

*Ustilago montaniensis* Ellis & Holway (; Ellis & Ev. N. Am. Fungi 2263; hyponym. 1889), Jour. Myc. 6: 119. 1891.

Sori in the inflorescence (more rarely in the individual spikelets and then smaller), usually enveloped by the leaves, elongate, chiefly 10–15 mm. in length, protected by an evident whitish false membrane, with small flattened columella; sterile cells of membrane and interior hyaline, thick-walled, chiefly subspherical, adhering in irregular groups that are easily separated into individual cells, usually smaller than the spores; spores dark reddish-brown, chiefly ovoid to subspherical, echinulate (sometimes rather bluntly), 12–15  $\mu$  in length.

ON POACEAE:

*Muhlenbergia racemosa* (*M. glomerata*), Montana.

*Muhlenbergia* sp., Montana.

TYPE LOCALITY: Sand Coulee, Montana, on *Muhlenbergia glomerata* (*M. racemosa*).

DISTRIBUTION: Montana.

ILLUSTRATION: Bull. Iowa Agr. Exp. Sta. 54: f. 114 (16).

EXSICCATI: Ellis & Ev. N. Am. Fungi 2263.

### 14. *Sphacelotheca strangulans* (Issat.) Clinton, Proc. Bost.

Soc. Nat. Hist. 31: 392. 1904.

*Ustilago strangulans* Issat. Scripta Bot. Hort. Univ. Petrop. 5: 225. 1896.

Sori in the inflorescence, forming lanceolate to linear bodies about 8–15 mm. in length, often concealed by the leaf-sheaths, covered by a conspicuous whitish false membrane, sometimes with abortive remains of spikelets at the tip, upon rupture disclosing an olive-black dusty spore-mass within which is a conspicuous columella; sterile cells of membrane easily separated into single, twin, or a chain of several cells, hyaline, ovoid to subspherical, chiefly smaller than the spores; spores dark reddish-brown, ovoid to chiefly subspherical or spherical, conspicuously verruculose, about 12–14.5  $\mu$  in length.

ON POACEAE:

*Eragrostis neo-mexicana*, Arizona.

TYPE LOCALITY: Russia, on *Eragrostis poaeoides*.

DISTRIBUTION: Arizona; also in Europe.

ILLUSTRATION: Bull. Torrey Club 31: 85, f. 7.

### 15. *Sphacelotheca Reiliana* (Kühn) Clinton, Jour. Myc. 8: 141. 1902.

*Ustilago Reiliana* Kühn; Rab. Fungi Eur. 1998. 1875.

*Ustilago Reiliana* f. *Zae* Pass.; Rab. Fungi Eur. 2096. 1876.

*Ustilago pulveracea* Cooke, Grevillea 4: 115. 1876. (Type from India, on *Zea Mays*.)

*Cintractia Reiliana* Clinton, Bull. Ill. Agr. Exp. Sta. 57: 346. 1900.

*Ustilago* (*Cintractia*) *Reiliana* f. *foliicola* Kellerm. Ohio S. U. Nat. 1: 9. 1900.

Sori very prominent, forming irregular masses including more or less of the entire panicle, usually 5–15 cm. in length, often at first protected by the leaf-sheath, with evident whitish false membrane enclosing the black-brown spore-mass and ray-like remains of the peduncles or columellas, in time becoming ruptured and spores scattered; sterile cells besides forming membrane scattered in usually subspherical groups through the spore-mass, chiefly subspherical, 7–15  $\mu$  in diameter; spores somewhat opaque, chiefly subspherical to



spherical or occasionally ovoid or slightly angled, minutely but abundantly verruculose, 9–14  $\mu$  in length.

ON POACEAE:

*Sorghum vulgare*, Illinois, Iowa, Kansas, Minnesota, Mississippi, Nebraska, New Jersey, Ohio, Texas.

*Zea Mays*, Kansas, Ohio.

TYPE LOCALITY: Egypt, on *Sorghum vulgare*.

DISTRIBUTION: New Jersey to Minnesota and Texas; also in South America, Europe, Asia and Africa.

ILLUSTRATIONS: Trans. Acad. Sci. St. Louis 7: *pl.* 25, *f.* 14–18; Bull. Ill. Agr. Exp. Sta. 57: *pl.* O, R5; Bull. Kan. Agr. Exp. Sta. 62: *pl.* 4, 6, 8–10; Brefeld, Unters. Gesammt. Myk. 5: *pl.* 11, *f.* 3–7; Ohio S. U. Nat. 1: *pl.* 2; Bull. Kan. Agr. Exp. Sta. 23: *pl.* 3–4.

EXSICCATI: Seym. & Earle, Econ. Fungi 547, C 45; Ellis & Ev. N. Am. Fungi 3564.

### 16. *Sphacelotheca Hydropiperis* (Schum.) DeBary, Verg.

Morph. Biol. Pilze 187. 1884.

*Uredo Hydropiperis* Schum. Enum. Pl. Saell. 2: 234. 1803.

*Ustilago Candollei* Tul. Ann. Sci. Nat. III. 7: 93. 1847.

*Ustilago Hydropiperis* Schröt. Beitr. Biol. Pfl. 2: 355. 1877.

Sori in ovaries, forming oblong or ovate bodies about 3–5 mm. in length, protected by floral envelopes at base, with false membrane dehiscing at apex, revealing purple-black spore-mass and more or less evident columella; sterile cells besides forming membrane also constituting part of the columella, spore-like (often probably immature spores), hyaline or occasionally violet-tinted, easily separating into individual cells, chiefly subspherical, 6–17  $\mu$ ; spores purplish, broadly oblong or ovate but chiefly subspherical, minutely but abundantly verruculose, mostly 10–17  $\mu$  in length.

ON POLYGONACEAE:

*Persicaria Hydropiper* (*Polygonum Hydropiper*), Nebraska, Rhode Island.

? *Persicaria Persicaria* (*Polygonum Persicaria*), New York.

*Persicaria punctata* (*Polygonum punctatum*, *P. acre*), Connecticut, Delaware, Illinois, Massachusetts.

*Persicaria* (*Polygonum*) sp., Missouri.

*Tracaulon sagittatum* (*Polygonum sagittatum*), Connecticut, Delaware, Illinois, Iowa, Maine, Massachusetts, Nebraska, New York, North Carolina, Vermont, West Virginia.

TYPE LOCALITY: Europe, on *Polygonum Hydropiper* (*Persicaria Hydropiper*).

DISTRIBUTION: New England to North Carolina and Nebraska; also in South America, Europe, Asia and Australia.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: *pl.* 3, *f.* 20, 21; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f.* 6, 37; Brefeld, Unters. Gesammt. Myk. 12: *pl.* 8, *f.* 16–25; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: *pl.* 3, *f.* 6; DeBary, Verg. Morph. Biol. Pilze *f.* 80.

EXSICCATI: Seym. & Earle, Econ. Fungi C 41, C 42, C 43; Shear, N. Y. Fungi 85; Ellis & Ev. N. Am. Fungi 289, 2261; Thüm. Myc. Univ. 1018; Ellis & Ev. Fungi Columb. 336, 543.

*Sphacelotheca Hydropiperis borealis* Clinton, Proc. Bost. Soc. Nat. Hist. 31: 395. 1904. Sorus very similar to that of the species with perhaps the false membrane not so prominent and with the columella more robust; sterile cells hyaline or slightly tinted, subspherical, thick-walled, chiefly slightly larger than the spores; spores violet-purple, ovoid to spherical or occasionally more irregular, often apparently smooth but really minutely granular, chiefly 8–11  $\mu$  in length. ON POLYGONACEAE: *Bistorta bistortoides* (*Polygonum bistortoides*), Washington, Wyoming.

### 3. *Melanopsichium* G. Beck, Ann. Nat. Hofmus. Wien 9: 122. 1894.

Sori on various parts of the host, forming dark-colored, hard, firmly agglutinated and conspicuous spore-masses; spores single, developed in irregular chambers or groups arising from a mixture of plant tissue and fungous threads, thus giving a tubercular character to the sorus, enveloped by a more or less permanent gelatinous envelope, discharging from spore-mass by absorption of water, of medium size; germination as in *Ustilago*.

Type, *Ustilago austro-americanum* Speg.

#### 1. *Melanopsichium austro-americanum* (Speg.) G. Beck, Ann. Nat.

Hofmus. Wien 9: 122. 1894.

*Ustilago austro-americanum* Speg. Anal. Soc. Ci. Argent. 12: 63. 1881.

Sori chiefly in the inflorescence, forming more or less irregularly lobed masses arising from the fusion of the infected parts, less commonly on the leaves and then smaller, usually prominent, 2 or 3 mm. to 2 cm. in length, internally somewhat nodular or tubercular, forming a hard, firmly agglutinated, black spore-mass mixed with plant tissues; spores oblong to chiefly subspherical, often somewhat irregular, with more or less evident



gelatinous envelope, usually rather prominently echinulate, chiefly 10–14  $\mu$ , the most elongate rarely 17  $\mu$ , in length.

ON POLYGONACEAE :

*Persicaria Hydropiper* (*Polygonum Hydropiper*), District of Columbia, Missouri.

*Persicaria incarnata* (*Polygonum incarnatum*, *P. lapathifolium incarnatum*), Illinois, Iowa, Missouri.

*Persicaria lapathifolia* (*Polygonum lapathifolium*), California, Illinois.

*Persicaria pennsylvanica* (*Polygonum pennsylvanicum*), Delaware, Illinois, Kansas, Missouri, Nebraska, New Jersey, New York.

*Persicaria* (*Polygonum*) sp., District of Columbia, Iowa, Missouri, New Jersey, Texas.

*Polygonum aviculare*, California.

? *Tovara virginiana* (*Polygonum virginianum*), Missouri.

TYPE LOCALITY : Argentina, on *Polygonum acre*.

DISTRIBUTION : New York to Texas and California ; also in South America.

ILLUSTRATIONS : Trans. Acad. Sci. St. Louis 7 : pl. 28, f. 9–12 ; Ann. Nat. Hofmus. Wien 9 : pl. 2, f. 2.

EXSICCATI : Seym. & Earle, Econ. Fungi 372, C 35 ; Rab.-Wint. Fungi Eur. 3501 ; Ellis & Ev. N. Am. Fungi 2262 ; Ellis, Ev. & Barth. Fungi Columb. 1940 ; Roum. Fungi Sel. 4416 ; Sydow, Ust. 101.

#### 4. CINTRACTIA Cornu, Ann. Sci. Nat. VI. 15 : 279. 1883.

*Anthracoidea* Bref. Unters. Gesammt. Myk. 12 : 144. 1895.

Sori on various parts of the host, often in the ovaries, forming a black usually rather firmly agglutinated spore-mass ; spores single, usually of medium or large size and of reddish-black color, formed in a centripetal manner from a fertile stroma usually surrounding a central columella of plant tissues, often freed from sorus by absorption of water ; germination apparently of a modified *Ustilago* type.

Type, *Ustilago axicola* Berk.

Sori usually dusty at maturity. (See also no. 11.)

Spores apparently smooth (rarely pitted).

Spores chiefly 8–14  $\mu$  in length.

Spores light reddish-brown.

Spores dark reddish-brown.

Spores chiefly 12–19  $\mu$  in length.

Spores often with lateral hyaline wings.

Spores under an immersion reticulately pitted.

Spores apparently quite smooth, irregular.

Spores with coarse scales.

Sori usually rather firmly agglutinated at maturity.

Sori in ovaries.

Sori usually spherical or subspherical.

Spores with evident hyaline envelopes.

Spores without evident hyaline envelopes.

Spores 16–20  $\mu$ , rarely larger.

Spores 20–30  $\mu$  in length.

Sori chiefly ovoid, rarely subspherical.

Sori surrounding peduncles (rarely in inflorescence).

Sori without prominent false membrane, linear.

Sori with prominent white fungous membrane.

Sori subspherical.

Sori oblong to linear.

2. *C. Taubertiana*.

4. *C. limitata*.

1. *C. Montagnei*.

3. *C. Psilocaryae*.

5. *C. Cyperi*.

6. *C. subinclusa*.

8. *C. externa*.

7. *C. Caricis*.

9. *C. Luzulae*.

12. *C. utriculicola*.

10. *C. Junci*.

11. *C. axicola*.

13. *C. leucoderma*.

#### 1. Cintractia Montagnei (Tul.) Magn. Abh. Bot. Ver. Prov.

Brand. 37 : 79. 1896.

*Ustilago Montagnei* Tul. Ann. Sci. Nat. III. 7 : 88. 1847.

Sori in ovaries, usually rather completely hidden by the enveloping glumes, oblong to subspherical, small, powdery or less commonly firm ; spores brown or black-brown, somewhat compressed laterally and so showing oblong to polygonal or subcircular according to view, usually with remains of enveloping membrane showing as prominent hyaline lateral wings, minutely pitted, 12–19  $\mu$ , chiefly 13–16  $\mu$ , in length.

ON CYPERACEAE :

*Rynchospora alba*, Connecticut, Maine, New York, Vermont ; Newfoundland.

*Rynchospora ciliata*, Florida.

*Rynchospora eximia*, Mexico.

*Rynchospora glomerata*, Connecticut, Massachusetts, Mississippi, New York.

*Rynchospora tenuis*, Mexico.

*Rynchospora* sp., North Carolina, South Carolina.

TYPE LOCALITY : Algeria, Africa, on *Schoenus* (*Rynchospora*) sp.

DISTRIBUTION : Newfoundland and New England to Florida and Mexico ; also in South America, Europe and Africa.

ILLUSTRATIONS : Ann. Sci. Nat. III. 7 : *pl.* 5, *f.* 31 ; Bull. Soc. Nat. Mosc. 40<sup>1</sup> : *pl.* 3, *f.* 9.

EXSICCATI : Seym. & Earle, Econ. Fungi C 7.

2. **Cintractia Taubertiana** (P. Henn.) Clinton, Jour. Myc. 8 : 142. 1902.

*Ustilago Taubertiana* P. Henn. Bot. Jahrb. 17 : 525, 1893.

Similar to *C. Montagnei*, except spores medium- to light-brown, usually angular, lateral wings apparently entirely lacking, usually 8–13  $\mu$  in length.

ON CYPERACEAE :

*Rynchospora alba*, Massachusetts, New Jersey.

*Rynchospora axillaris* (*R. cephalantha*), Mississippi.

*Rynchospora cymosa*, Maryland.

*Rynchospora fascicularis*, Florida.

*Rynchospora inexpansa*, South Carolina.

*Rynchospora* sp., Alabama, Texas.

TYPE LOCALITY : Minas Geraës, Brazil, on *Rynchospora tenuis*.

DISTRIBUTION : Massachusetts to Florida and Texas ; also in South America.

3. **Cintractia Psilocaryae** (Tracy & Earle) Clinton, Jour. Myc. 8 : 142. 1902.

*Ustilago Psilocaryae* Tracy & Earle, Bull. Torrey Club 26 : 493. 1899.

Sori in ovaries, inconspicuous, hidden by glumes, in time powdery ; spores dark reddish-brown, somewhat laterally compressed and so oval to circular in cross-section according to view, usually conspicuously angled, with very dark and irregularly thickened walls (often 3  $\mu$ ), under an immersion lens with the compressed sides showing faint reticulated appearance at center and pits toward the circumference, chiefly 12–15  $\mu$  in length.

ON CYPERACEAE :

*Psilocarya nitens*, Florida, Mississippi.

*Psilocarya scirpoides*, Massachusetts, Rhode Island.

TYPE LOCALITY : Horn Island, Mississippi, on *Psilocarya rynchosporoides* (*P. nitens*).

DISTRIBUTION : Massachusetts and Rhode Island ; Florida and Mississippi.

4. **Cintractia limitata** Clinton, Proc. Bost. Soc. Nat.

Hist. 31 : 399. 1904.

Sori in the spikelets, infecting only part, at first concealed by the enveloping glumes but with the semi-agglutinated spore-mass finally becoming powdery and showing in the vicinity of the infected spikelets as a purplish-black powder ; spores chiefly dark reddish-brown, ovate or ovoid to chiefly subspherical or spherical, occasionally somewhat polyhedral, often with pitted contents, smooth, 9.5–14  $\mu$  in length.

ON CYPERACEAE :

*Cyperus ligularis*, Porto Rico.

TYPE LOCALITY : Mayaguez and San Juan, Porto Rico, on *Cyperus ligularis*.

DISTRIBUTION : Known only from Porto Rico.

5. **Cintractia Cyperi** Clinton, Proc. Bost. Soc. Nat. Hist. 31 : 400. 1904.

Sori in the interior of the spikelets, infecting all in the head, hidden by the enveloping glumes, scarcely modifying appearance of infected parts, so that diseased heads are told from the sound only by slightly darker color, in time shedding somewhat the brown-black granular spore-mass ; spores reddish-brown, more or less agglutinated but easily broken up into single spores, oblong to polyhedral but chiefly irregular, apparently smooth but with epispore often showing darker lines due to pressure of spore-mass, 12–18  $\mu$ , or the most elongate 22  $\mu$ , in length.

ON CYPERACEAE :

*Cyperus filiculmis*, Connecticut.

TYPE LOCALITY : North Haven (sand plains), Connecticut, on *Cyperus filiculmis*.

DISTRIBUTION : Connecticut.

EXSICCATI : Seym. & Earle, Econ. Fungi C 102.

6. **Cintractia subinclusa** (Körn.) Magn. Abh. Bot. Ver. Prov.

Brand. 37 : 79. 1896.

*Ustilago subinclusa* Körn.; Rab. Hedwigia 13 : 159. 1874.

*Anthracoidea subinclusa* Bref. Unters. Gesammt. Myk. 12 : 146. 1895.

Sori in the ovaries, often concealed by the perigynium, subspherical, about 2–4 mm. in



diameter, at first agglutinated but as usually seen forming a more or less granular olive-black spore-mass; spores dark olive-brown, usually subopaque, ovoid to subspherical, occasionally more elongate and often somewhat angular, provided with coarse, tinted scales showing at circumference as truncate appendages, chiefly 14–19  $\mu$ , the most elongate rarely 22  $\mu$ , in length.

## ON CYPERACEAE:

- Carex abacta* (*C. Michauxiana*), British America, New Brunswick.
- Carex lanuginosa*, Nevada, Wisconsin.
- Carex lupulina*, Wisconsin.
- Carex oligosperma*, Newfoundland.
- Carex trichocarpa Deweyi*, North Dakota.
- Carex utriculata*, Nevada, Oregon, Wisconsin.
- Carex* sp., Maine.

TYPE LOCALITY: Dresden, Germany, on *Carex riparia*.

DISTRIBUTION: Newfoundland to Nevada and Oregon; also in Europe.

ILLUSTRATION: Brefeld, Unters. Gesamt. Myk. 12: pl. 9, f. 1–3.

EXSICCATI: Ellis & Ev. N. Am. Fungi 1889; Griff. West Am. Fungi 231, 231a, 232.

7. *Cintractia Caricis* (Pers.) Magn. Abh. Bot. Ver. Prov.

Brand. 37: 79. 1896.

*Uredo Caricis* Pers. Syn. Fung. 225. 1801.

*Ustilago Caricis* Ung. Infl. Bodens 211. 1836.

*Ustilago urceolorum* Tul. Ann. Sci. Nat. III. 7: 86. 1847.

*Ustilago Scirpi* Kühn, Hedwigia 12: 150. 1873.

*Anthracoidea Caricis* Bref. Unters. Gesamt. Myk. 12: 144. 1895.

Sori in ovaries, about 3–4 mm. in diameter, at first hidden by the perigynium, then exposed as subspherical (very rarely more elongate) bodies protected by a false white membrane which soon wears away disclosing a black firmly agglutinated mass of spores, with distinct columella; sterile cells of membrane usually not very distinct because semigelatinized; spores subopaque, chiefly irregularly polyhedral, occasionally subspherical, or more elongate in lateral view, granular to papillate or sometimes indistinctly pitted, often with signs of hyaline envelope, 16–27  $\mu$ , chiefly 18–22  $\mu$ , in length.

## ON CYPERACEAE:

- Carex altocaulis* (*C. vaginata*), Maine; Labrador.
- Carex arctata*, New Hampshire.
- Carex Bigelovii* (*C. vulgaris hyperborea*), Greenland.
- Carex Buxbaumii* (*C. fusca*), Pennsylvania.
- Carex canescens*, British Columbia, Canada.
- Carex crinita*, New York.
- Carex Douglasii*, Colorado, Nevada, Oregon, Washington.
- Carex elynoides*, Colorado.
- Carex exilis*, Massachusetts.
- Carex festiva*, Alaska; British Columbia.
- Carex filifolia*, California.
- Carex folliculata australis*, Mississippi.
- Carex glareosa*, Greenland.
- Carex Gmelini*, Alaska.
- Carex Goodenovii* (*C. turfosa*), Greenland.
- Carex incurva*, Greenland.
- Carex invisus*, British Columbia.
- Carex lagopina*, Islands in Bering Sea.
- Carex limosa*, Michigan, Wisconsin.
- Carex limosa stygia*, Alaska.
- Carex livida*, Labrador.
- Carex luzulaefolia*, California.
- Carex magellanica*, New York.
- Carex marcida*, Montana.
- Carex monile*, Vermont.
- Carex nardina*, Greenland.
- Carex nigricans*, Utah.
- Carex obnupta*, California.
- Carex occidentalis*, Wyoming.
- Carex oligosperma*, New York.
- Carex pedunculata*, Maine.
- Carex pennsylvanica*, Connecticut, Illinois, Iowa, Maine, Massachusetts, Minnesota, Montana, New Hampshire, New York, Pennsylvania, Rhode Island.
- Carex pseudoscirpoidea*, Wyoming.
- ? *Carex Redowskyana* (*C. dioica*), Canada.
- Carex rigida*, Greenland, Labrador.
- Carex rupestris*, Canada, Greenland.
- Carex salina*, Labrador.

*Carex scirpoidea*, Greenland; Newfoundland.  
*Carex siccata*, Vermont; Canada.  
*Carex sitchensis*, California.  
*Carex sterilis* (*C. echinata microstachys*), Vermont.  
*Carex sterilis cephalantha* (*C. echinata cephalantha*), New Hampshire, New York.  
*Carex stramineiformis*, California.  
*Carex stricta*, Nebraska, New York, Wisconsin.  
*Carex telanica*, Massachusetts.  
*Carex umbellata*, Delaware, New Hampshire, New York.  
*Carex umbellata vicina*, Maine.  
*Carex utriculata*, New York.  
*Carex varia*, Ohio.  
*Carex variabilis*, Washington.  
*Carex* spp., California, Colorado, Massachusetts, Michigan, Missouri, New Hampshire, North Carolina, Rhode Island, Utah, Vermont, Washington, Wyoming.  
*Elyna Bellardi* (*Kobresia scirpina*), Greenland.  
*Kobresia bipartita* (*K. caricina*), ———.  
*Scirpus caespitosus*, Greenland.

TYPE LOCALITY: Europe, on *Carex montana*.

DISTRIBUTION: Throughout the area containing species of *Carex*.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 4, f. 7-10; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 8, 27; Brefeld, Unters. Gesammt. Myk. 12: pl. 9, f. 4-5; Tubeuf, Diseases Pl. f. 163; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 8; Mem. Acad. Sci. Bologna V. 3: 527.

EXSICCATI: Sydow, Ust. 173, 313, 314, 315; Griff. West Am. Fungi 209, 209a, 210, 211; Ellis & Ev. N. Am. Fungi 1090, 2259; Shear, N. Y. Fungi 81; Seym. & Earle, Econ. Fungi 55, C 3, C 4, C 5, C 101; Ellis & Ev. Fungi Columb. 135, 1485.

#### 8. *Cintractia externa* (Griff.) Clinton, Jour. Myc. 8: 142. 1902.

*Tilletia externa* Griff. Bull. Torrey Club 29: 290. 1902.

Sori in the ovaries, subspherical, about 3 or 4 mm. in diameter, forming a firmly agglutinated black spore-mass that on absorbing moisture becomes smeared over adjacent parts, with evident small columella; spores black-brown, opaque, ovoid to spherical, smooth, provided with hyaline membranes of which the thin inner is formed by part of cell-wall and the outer by the evident remains of the fertile hypha, 17-22  $\mu$  in diameter.

ON CYPERACEAE:

*Carex filifolia*, Montana, Nebraska, Wyoming.

TYPE LOCALITY: Burnett's ranch, near Buffalo, Wyoming, on *Carex filifolia*.

DISTRIBUTION: Montana, Wyoming; and Nebraska.

ILLUSTRATION: Bull. Torrey Club 29: 291, f. 1.

EXSICCATI: Seym. & Earle, Econ. Fungi C 2; Griff. West Am. Fungi 305.

#### 9. *Cintractia Luzulae* (Sacc.) Clinton, Jour. Myc. 8: 143. 1902.

*Ustilago Luzulae* Sacc. Myc. Ven. Spec. 73. 1873.

Sori in the ovaries or occasionally extending to the base of the flowers, subspherical, about 2 mm. in diameter, usually concealed by the perianth, forming at first a firmly agglutinated but eventually a somewhat granular black spore-mass, with inconspicuous columella; spores dark-reddish to black-brown, subopaque or opaque, compressed somewhat laterally and so appearing oblong to chiefly oval or circular according to view, usually more or less angled, apparently smooth but under an immersion showing subreticulately pitted, 20-30  $\mu$  in length.

ON JUNCACEAE:

*Juncoides campestre* (*Luzula campestris*), Indiana.

TYPE LOCALITY: Italy, on *Luzula Forsteri*.

DISTRIBUTION: Indiana; also in Europe.

ILLUSTRATION: Sacc. Myc. Ven. Spec. pl. 17, f. 33, 34.

#### 10. *Cintractia Junci* (Schw.) Trel. Bull. Torrey Club 12: 70. 1885.

*Caeoma Junci* Schw. Trans. Am. Phil. Soc. II. 4: 290. 1832.

*Ustilago Junci* Curt. Cat. Pl. N. Car. 123. 1867.

*Ustilago Liebmanni* P. Henn. Hedwigia 33: 229. 1894. (Type from Mexico, on *Juncus* sp., not *Luzula* sp., as stated.)

Sori usually linear, surrounding peduncles and pedicels for more or less of their length, sometimes in basal parts of the flowers and even occasionally filling the ovaries, forming an agglutinated black spore-mass; sterile cells usually not evident since inconspicuous and early evanescent; spores black-brown, subopaque, more or less agglutinated, somewhat



compressed laterally and so appearing oblong to irregularly polygonal or subcircular according to view, minutely pitted, 14–22  $\mu$  in length.

ON JUNCACEAE:

*Juncus acuminatus*, Mississippi.

*Juncus effusus*, New Jersey.

*Juncus tenuis*, Connecticut, Illinois, Iowa, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, Vermont, Wisconsin.

*Juncus* sp., Massachusetts, North Carolina; Mexico.

TYPE LOCALITY: Bethlehem, Pennsylvania, on *Juncus tenuis*.

DISTRIBUTION: New England to Wisconsin, North Carolina, and Mexico; also in South America.

ILLUSTRATIONS: Bull. Torrey Club 12: *pl.* 50; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f.* 28.

EXSICCATI: Seym. & Earle, Econ. Fungi 51, *C* 6, *C* 103; Ellis & Ev. Fungi Columb. 472; Kellerm. Ohio Fungi 66; Ellis & Ev. N. Am. Fungi 290; Thüm. Myc. Univ. 1622; Rab.-Wint. Fungi Eur. 2901.

11. *Cintractia axicola* (Berk.) Cornu, Ann. Sci. Nat. VI. 15: 279. 1883.

*Ustilago axicola* Berk. Ann. Mag. Nat. Hist. II. 9: 200. 1852.

*Ustilago axicola* var. Berk. Grevillea 3: 59. 1874.

*Ustilago Fimbristylis* Thüm. Bull. Torrey Club 6: 95. 1876. (Type from Virginia, on *Fimbristylis autumnalis*.)

Sori usually at base of peduncles or pedicels, rarely in the spikelets, usually roundish, about 3–5 mm. in diameter, at first with whitish false membrane covering the olive-black agglutinated spore-mass, but this soon disappearing and spores becoming less firmly agglutinated; sterile cells usually indefinite through gelatinization of wall, cellular or somewhat thread-shaped, with little or no lumen; spores reddish-brown, compressed laterally and so appearing oblong to subcircular according to view, often somewhat angled, smooth, 12–18  $\mu$  in length.

ON CYPERACEAE:

*Fimbristylis autumnalis*, Alabama, Delaware, Mississippi, Virginia.

*Fimbristylis diphylla*, Porto Rico.

*Fimbristylis Holwayana*, Mexico.

*Fimbristylis* sp., Costa Rica, Cuba, Jamaica, Mexico, San Domingo, St. Kitts.

TYPE LOCALITY: San Domingo, on "some scirpoid plant" [*Fimbristylis* sp.].

DISTRIBUTION: Delaware to Mississippi, Mexico, Costa Rica, and the West Indies.

ILLUSTRATION: Ann. Sci. Nat. VI. 15: *pl.* 15, *f.* 1–3.

EXSICCATI: Seym. & Earle, Econ. Fungi 530; Sydow, Ust. 219.

*Cintractia axicola* minor Clinton, Jour. Myc. 8: 143. 1902. Spores smaller, 10–13  $\mu$  in length.

ON CYPERACEAE: *Cyperus Grayii*, New York; *Cyperus sphacelatus*, Porto Rico. EXSICCATI: Ellis & Ev. N. Am. Fungi 2423.

12. *Cintractia utriculicola* (P. Henn.) Clinton, Jour. Myc. 8: 143. 1902.

*Cintractia leucoderma* f. *utriculicola* P. Henn. Hedwigia 34: 336. 1895.

*Cintractia axicola* f. *spicularum* Juel, Bih. K. Sv. Vet.-Akad. Handl. 23(3)<sup>10</sup>: 7. 1897.

Sori in ovaries, ovoid to subspherical, chiefly 3–6 mm. in length, covered by evident whitish false membrane that ruptures irregularly from the apex disclosing a semi-agglutinated black spore-mass; sterile cells hyaline, chiefly subspherical, usually semigelatinized; spores dark reddish-brown, often subopaque, with irregular lighter areas, somewhat compressed laterally and so appearing oblong to circular according to view, smooth, 11–16  $\mu$  in length.

ON CYPERACEAE:

*Rynchospora corymbosa* (*R. aurea*), Porto Rico.

*Rynchospora* sp., Mexico.

TYPE LOCALITY: Brazil, on *Rynchospora gigantea*.

DISTRIBUTION: Porto Rico and Mexico; also in South America.

EXSICCATI: Seym. & Earle, Econ. Fungi 105; Sydow, Ust. 220.

13. *Cintractia leucoderma* (Berk.) P. Henn. Hedwigia 34: 335. 1895.

*Ustilago leucoderma* Berk. Ann. Mag. Nat. Hist. II. 9: 200. 1852.

*Cintractia Krugiana* Magn. Bot. Jahrb. 17: 490. 1893. (Type from Porto Rico, on *Rynchospora gigantea*.)

*Cintractia affinis* Peck, N. Y. State Mus. Bull. 67: 28. 1903. (Type from New York, on *Rynchospora macrostachya*.)

Sori surrounding peduncles or pedicels or often involving base of the rachis (sometimes even on stems), forming conspicuous elongate bodies 7–30 mm. in length, covered with a thick white false membrane that gradually flakes away, leaving exposed the firmly

agglutinated black spore-mass ; sterile cells more or less gelatinized, often almost in fragments ; spores medium to dark reddish-brown, somewhat compressed laterally and so appearing oblong to circular according to view, occasionally obtusely angled, at times with hyaline fragments still attached, verruculose though sometimes rather obscurely, 13-16  $\mu$ , rarely 18  $\mu$  or even 20  $\mu$ , in length.

ON CYPERACEAE :

*Rynchospora corniculata*, Florida.

*Rynchospora corniculata macrostachya* (*R. macrostachya*), New York.

*Rynchospora gigantea*, Porto Rico.

*Rynchospora Tracyi*, Florida.

*Rynchospora* sp., Mexico.

? *Rynchospora*, Cuba, San Domingo.

TYPE LOCALITY : San Domingo, "on the sheaths of some sedge" [probably *Rynchospora* sp.].

DISTRIBUTION : New York, Florida, Cuba, San Domingo, Porto Rico, Mexico ; also from South America, Asia and Australia.

ILLUSTRATION : Bot. Jahrb. 17 : 490.

EXSICCATI : Sydow, Ust. 224 ; Seym. & Earle, Econ. Fungi C 104.

## 5. SCHIZONELLA Schröt. Beitr. Biol. Pfl. 2 : 362. 1877.

Sori in the leaves, forming black agglutinated spore-masses ; spores in pairs, produced serially in the fertile threads, arising by internal division of a mother cell, usually becoming somewhat laxly connected by the bulging of contiguous surfaces or sometimes separating into individual cells, of medium size ; germination by means of a short promycelium, the cells of which give rise to sporidia as with *Ustilago*.

Type, *Uredo melanogramma* DC.

### 1. Schizonella melanogramma (DC.) Schröt. Beitr. Biol.

Pfl. 2 : 352. 1877.

*Uredo melanogramma* DC. Fl. Fr. 6 : 75. 1815.

*Ustilago ambiens* Karst. Oefv. K. Sv. Vet.-Akad. Förh. 29<sup>2</sup> : 108. 1872. (Type from Spitzbergen.)

*Urocystis pusilla* Cooke & Peck ; Peck, Rep. N. Y. State Mus. 25 : 90. 1873. (Type from New York, on *Carex pennsylvanica*.)

*Geminella melanogramma* Magn. Hedwigia 14 : 19. 1875.

*Entyloma ambiens* Johans. Oefv. K. Sv. Vet.-Akad. Förh. 41<sup>9</sup> : 160. 1885.

Sori in the leaves, chiefly epiphyllous, linear, 1-2 mm., or often by terminal fusion of considerable length, forming rather permanently agglutinated black striae ; spores dark reddish-brown, often with the cells becoming partially or entirely separated by the bulging of the contiguous sides, chiefly ellipsoidal to hemispherical or, when separated into cells, polyhedral to subspherical, chiefly 8-12  $\mu$  in length.

ON CYPERACEAE :

*Carex atratiformis* (*C. atrata*), Colorado.

*Carex Hoodii*, Utah.

*Carex laxiflora*, Illinois.

*Carex pennsylvanica*, Colorado, Connecticut, Illinois, Iowa, Massachusetts, Michigan, New York, Wisconsin.

*Carex* sp., California, Colorado, Indiana, Michigan, Nevada, Oregon, Utah, Wyoming.

TYPE LOCALITY : Jura, Europe, on *Carex montana*.

DISTRIBUTION : New England to Oregon and California ; also in South America and Europe.

ILLUSTRATIONS : Bull. Conn. Geol. Nat. Hist. Surv. 5 : f. 9, 35 ; Brefeld, Unters. Gesammt. Myk. 12 : pl. 9, f. 6-12 ; Beitr. Biol. Pfl. 2 : pl. 12, f. 6.

EXSICCATI : Thüm. Myc. Univ. 928 ; Ellis, N. Am. Fungi 291 ; Seym. & Earle, Econ. Fungi 56, C36, C37 ; Ellis & Ev. Fungi Columb. 474 ; Griff. West Am. Fungi 225.

## 6. MYKOSYRINX G. Beck, Ann. Nat. Hofmus. Wien 9 : 123. 1894.

Sori in the interior of the pedicels and peduncles of the inflorescence, forming a double-layered fertile stroma lining these and giving rise to a dusty spore-mass which fills the hollowed organs ; spores in pairs, formed from mother-cells produced singly in the ends of short hyphae, with cells eventually becoming loosely connected by bulging of contiguous surfaces ; germination not known (?).

Type, *Uredo Cissi* DC.



1. **Mykosyrinx Cissi** (DC.) G. Beck, Ann. Nat.  
Hofmus. Wien 9 : 123. 1894.

*Uredo Cissi* DC. in Poir. Encycl. Meth. Bot. 8 : 228. 1808.

*Geminella exotica* Schröt. Hedwigia 15 : 135. 1876. (Type from Brazil, on *Cissus sicyoides*.)

*Geminella exotica Decandollei* Fisch de Waldh. Aperçu Syst. Ust. 43. 1877.

*Schroeteria Cissi* De-Toni ; Sacc. Syll. Fung. 72 : 501. 1888.

Sori in peduncles and pedicels of the inflorescence, distorting the infected parts somewhat and filling their interior with a dusty purple-black spore-mass ; spores dark reddish-brown, subopaque, chiefly subspherical, spherical, or occasionally slightly angled, two-celled, with a common enveloping outer membrane which ruptures at juncture of cells allowing these to separate at their margins though still attached at the bulging centers, smooth, about 11-14  $\mu$  (individual cells) in length.

ON VITACEAE :

*Cissus acida*, Porto Rico.

*Cissus erosa*, Porto Rico.

*Cissus sicyoides*, Florida ; Bahamas ; Jamaica ; Porto Rico ; San Domingo.

*Cissus* sp., Cuba ; Dominica ; Mexico.

*Vitaceae*, Haiti ; Mexico.

TYPE LOCALITY : San Domingo, on *Cissus sicyoides*.

DISTRIBUTION : Florida ; Mexico ; West Indies ; also in South America and Africa.

ILLUSTRATIONS : Malpighia 13 : 522-530 ; Ann. Nat. Hofmus. Wien 9 : pl. 2, f. 3.

EXSICCATI : Krypt. Exs. Ed. Mus. Pal. Vind. 11 ; Sydow, Ust. 48.

7. **SOROSPORIUM** Rud. Linnaea 4 : 116. 1829.

Sori in various parts of the host, forming dusty dark-colored spore-masses ; spore-balls composed of numerous fertile cells, often rather loosely united and frequently at maturity completely separating, of medium size ; spores usually olive- or reddish-brown, of medium size ; germination similar to that of *Ustilago*, sometimes with elongate germ-thread and no sporidia.

Type, *Sorosporium Saponariae* Rud.

Sori in the ovaries, usually small.

Spore-balls quite temporary.

Spores 6-9  $\mu$  in length.

Spores 11-16  $\mu$  in length.

Spore-balls rather permanent.

Spores 8-12  $\mu$ , light reddish-brown.

Spores 10-16  $\mu$ , dark reddish-brown.

Sori aborting the inflorescence, very elongate.

Spore-balls composed of many spores.

Spores rather thin-walled.

Spores 9-13  $\mu$  in length.

Spores chiefly smooth.

Spores chiefly verruculose.

Spores 12-19  $\mu$  in length.

Spores rather thick-walled (3  $\mu$ ).

Spore-balls of few spores, usually 6-20.

1. *S. consanguineum*.

2. *S. Eriochloae*.

3. *S. Everhartii*.

9. *S. Rhynchosporae*.

4. *S. contortum*.

5. *S. Syntherismae*.

6. *S. Ellisii*.

7. *S. provinciale*.

8. *S. granulosum*.

1. **Sorosporium consanguineum** Ell. & Ev. Jour. Myc. 3 : 56. 1887.

*Ustilago Aristidae* Peck, Bull. Torrey Club 12 : 35. 1885. (Type from Texas, on *Aristida* sp.)  
? Not *Sorosporium Aristidae* Neger. 1896.

Sori in ovaries, entirely enclosed by glumes though often somewhat visible through these ; spore-balls oblong to subspherical, more or less irregular, at first firm but with age usually becoming entirely dissolved, about 80-135  $\mu$  in length ; spores reddish-brown, ovoid to subspherical but chiefly polyhedral, smooth, mostly 6-9  $\mu$  in length.

ON POACEAE :

*Aristida arizonica* (*A. Rusbyi*), Arizona.

*Aristida basiramea*, South Dakota.

*Aristida longiseta* (*A. purpurea*), Nebraska.

*Aristida longiseta robusta*, Nebraska.

*Aristida purpurascens*, Colorado.

*Aristida Schiedeana*, Arizona.

*Aristida* sp., Kansas, Texas ; Mexico.

TYPE LOCALITY : Northern Arizona, on "*Aristida Rusbyi*" (*A. arizonica*).

DISTRIBUTION : South Dakota to Mexico.

ILLUSTRATIONS: Trans. Acad. Sci. St. Louis 7: *pl.* 25, *f.* 19-23; Bull. Iowa Agr. Exp. Sta. 54: *f.* 114 (19).

EXSICCATI: Ellis & Ev. Fungi Columb. 1600; Griff. West Am. Fungi 214, 214a.

## 2. *Sorosporium Eriochloae* Griff. Bull. Torrey Club 31: 84. 1904.

Sori in ovaries, oblong, about 2-3 mm. in length, more or less concealed by the enveloping glumes, with a conspicuous whitish false membrane that ruptures in lobes from the apex disclosing a blackish somewhat agglutinated spore-mass and a small columella; sterile cells of false membrane adhering together rather firmly, chiefly cubical to 2-3 times as long as broad, occasionally more rounded; spore-balls rather irregular but chiefly ovoid to subspherical, soon separating into spores, usually 60-100  $\mu$  in length; spores somewhat agglutinated, dark reddish-brown, ovoid to subspherical or occasionally polyhedral, smooth or minutely verruculose, 11-16  $\mu$  in length.

ON POACEAE:

*Monachne punctata* (*Eriochloa punctata*), Arizona.

TYPE LOCALITY: Empire Ranch, Santa Rita Mountains, Arizona, on *Eriochloa punctata* (*Monachne punctata*).

DISTRIBUTION: Known only from the type locality.

ILLUSTRATION: Bull. Torrey Club 31: 85, *f.* 13-16.

## 3. *Sorosporium Everhartii* Ellis & Gall. Jour. Myc. 6: 32. 1890.

*Tolyposporium Everhartii* Dietel, in E. & P. Nat. Pfl. 11\*\* : 14. 1897.

Sori in ovaries of the spikelets, linear, about 1-2 cm. in length, with prominent false membrane dehiscing from apex into several lobes, with black-brown agglutinated spore-mass that wears away from apex disclosing the flattened columella of plant tissue; spore-balls oblong to subspherical, composed of many rather firmly agglutinated spores, usually 55-125  $\mu$  in length; spores reddish-brown, inner often nearly hyaline, polyhedral or sometimes ovoid to subspherical, smooth or outermost spores granular-verruculose, chiefly 8-12  $\mu$  in length.

ON POACEAE:

*Andropogon glomeratus* (*A. macrourus*), Florida.

*Andropogon virginicus*, Alabama, Georgia, Mississippi, New Jersey.

*Schizachyrium scoparium* (*Andropogon scoparius*), Alabama, Connecticut.

TYPE LOCALITY: Newfield, New Jersey, on *Andropogon virginicus*.

DISTRIBUTION: Connecticut to Florida and Mississippi.

EXSICCATI: Ellis & Ev. N. Am. Fungi 2265 (*b*); Sydow, Ust. 190; Ellis & Ev. Fungi Columb. 473; Seym. & Earle, Econ. Fungi 74, *C* 115; Rav. Fung. Car. II. 98.

## 4. *Sorosporium contortum* Griff. Bull. Torrey Club 31: 83. 1904.

Sori in the inflorescence, forming linear bodies often 3-5 cm. in length, with basal part concealed by leaves but apical end exposed, rupturing upon maturity and scattering the black granular spore-mass and leaving behind the prominent shredded false membrane and the filaments of plant tissue; spore-balls opaque, ovoid to subspherical or occasionally more irregular, firm, composed of many spores, chiefly 50-90  $\mu$  in length; sterile membrane composed of hyaline thick-walled cells rather firmly bound together and cubical or 2-3 times as long as broad; spores reddish-brown, interior ones often scarcely colored, ovoid to subspherical or polyhedral, smooth or outer ones becoming obscurely verruculose, 9-13  $\mu$  in length.

ON POACEAE:

*Heteropogon contortus* (*Andropogon contortus*), Arizona; Mexico.

TYPE LOCALITY: Santa Rita Mountains, Arizona, on *Andropogon contortus* (*Heteropogon contortus*).

DISTRIBUTION: Arizona and Mexico (Guadalajara).

ILLUSTRATION: Bull. Torrey Club 31: 85, *f.* 1-3.

EXSICCATI: Seym. & Earle, Econ. Fungi *C* 114.

## 5. *Sorosporium Syntherismae* (Peck) Farl.; Farl. & Seym. Host Index N. Am. Fungi 152. 1891.

*Ustilago Syntherismae* Peck, Ann. Rep. N. Y. State Mus. 27: 103. 1875.

*Sorosporium Cenchri* P. Henn. Hedwigia 35: 221. 1896. (Type from Brazil, on *Cenchrus echinatus*.)

Sori involving entire inflorescence, elongate, 3-7 cm. in length, or rarely limited to



individual spikelets and then shorter, protected by leaf-sheaths, provided with false membrane that ruptures from apex down disclosing black-brown spore-mass and shredded filaments of plant tissue; sterile cells of membrane hyaline, oblong to cubical or subspherical, with tendency to adhere in filaments when separated; spore-balls rather evanescent, variable in shape and size, irregularly oblong to subspherical, 40–100  $\mu$  in length; spores very minutely verruculose, inner often appearing smooth, subspherical or somewhat polyhedral to occasionally more elongate, chiefly 9–13  $\mu$  in length.

## ON POACEAE:

*Cenchrus echinatus*, Mexico (Guadalajara).

*Cenchrus multiflorus*, Mexico.

*Cenchrus tribuloides*, Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Nebraska, New York, South Dakota, Texas, Wisconsin.

*Cenchrus* sp., Kansas, Texas; Mexico.

*Panicum agrostoides*, Missouri.

*Panicum capillare*, Indiana, Iowa, Kansas, Massachusetts, Nebraska, South Dakota.

*Panicum hirticaulum*, Arizona.

*Panicum proliferum*, Delaware, District of Columbia, Illinois, Iowa, Kansas, Missouri, Nebraska, North Carolina, Ohio.

*Panicum* sp., Kansas, Missouri.

TYPE LOCALITY: New York, on *Cenchrus tribuloides*.

DISTRIBUTION: New England to North Carolina, South Dakota, and Mexico; also in South America.

ILLUSTRATIONS: Trans. Acad. Sci. St. Louis 7: *pl.* 26, *f.* 1, 2, 6–13, *pl.* 27, *f.* 1–3, 9–12; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f.* 7, 36; Bull. Iowa Agr. Exp. Sta. 54: *f.* 114 (3, 5, 6).

EXSICCATI: Seym. & Earle, Econ. Fungi 66, 398, C 39, C 40, C 116, C 117; Ellis & Ev. Fungi Columb. 646, 748, 1785, 1786; Sydow, Ust. 163, 348; Ellis & Ev. N. Am. Fungi 1890a, 2260a, 2260b; Griff. West Am. Fungi 30; Kellerm. Ohio Fungi 41.

6. *Sorosporium Ellisii* Wint. Hedwigia 22: 2. Ja 1883. — Bull. Torrey Club 10: 7. Ja 1883.

Sori elongate, including the entire inflorescence or more rarely confined to the individual spikelets, chiefly 1–5 cm. in length, often hidden by enveloping leaf-sheaths, provided with evident false membrane, within which is the black-brown dusty spore-mass; spore-balls dark reddish-brown, subopaque, rather temporary, oblong to subspherical, chiefly 40–100  $\mu$  in length; spores somewhat irregular, oblong to chiefly subspherical or polyhedral, thick-walled (wall often irregularly thickened and lighter-colored where spores have been in contact), verruculose, chiefly 12–19  $\mu$  in length.

## ON POACEAE:

*Andropogon virginicus*, New Jersey.

*Aristida dicholoma*, Ohio, Pennsylvania.

*Schizachyrium scoparium* (*Andropogon scoparius*), Connecticut, Illinois, Kansas.

TYPE LOCALITY: Newfield, New Jersey, on *Andropogon virginicus*.

DISTRIBUTION: Connecticut and New Jersey to Kansas.

ILLUSTRATION: Trans. Acad. Sci. St. Louis 7: *pl.* 26, *f.* 3, *pl.* 29, *f.* 6–8.

EXSICCATI: Seym. & Earle, Econ. Fungi C 38; Ellis & Ev. N. Am. Fungi 1099, 1494.

7. *Sorosporium provinciale* (Ellis & Gall.) Clinton, Jour. Myc. 8: 145. 1902.

*Sorosporium Ellisii provinciale* Ellis & Gall. Jour. Myc. 6: 31. 1890.

Sori in the inflorescence, linear, often 6 cm. or more in length, concealed within the leaf-sheath or upper part protruding, with false membrane that becomes lacerated exposing the black-brown granular spore-mass; spore-balls variable, apparently gradually wearing away, chiefly 50–100  $\mu$  or possibly even longer; spores medium-light reddish-brown though often darker in places, rather regular, ovoid to chiefly subspherical, minutely verruculose, with thick uniform cell-wall (3  $\mu$ ), 14–19  $\mu$  in length.

## ON POACEAE:

*Andropogon furcatus*, Missouri, Nebraska.

TYPE LOCALITY: Saline County, Missouri, on *Andropogon provinciale* (*A. furcatus*).

DISTRIBUTION: Missouri and Nebraska.

ILLUSTRATION: Bull. Iowa Agr. Exp. Sta. 54: *f.* 120 (12).

EXSICCATI: Ellis & Ev. N. Am. Fungi 2425.

8. *Sorosporium granulosum* Ellis & Tracy, Jour. Myc. 6: 77. 1890.

Sori taking the place of the aborted inflorescence, linear, usually enclosed in the leaf-sheaths, forming an agglutinated brown-black spore-mass; spore-balls reddish- to black-

brown, usually opaque, ovoid to spherical, quite firm, composed of 6–20 or more spores, chiefly 40–80  $\mu$  in length; spores dark reddish-brown, ovoid to spherical or polyhedral, smooth, about 12–17  $\mu$  in length.

ON POACEAE:

*Stipa comata*, Wyoming.

*Stipa viridula*, Colorado.

TYPE LOCALITY: Trinidad, Colorado, on *Stipa viridula*.

DISTRIBUTION: Colorado and Wyoming.

#### 9. *Sorosporium Rhynchosporae* P. Henn. Hedwigia 35 : 222. 1896.

Sori in ovaries, completely concealed by the glumes, more or less subspherical, about 1 or 2 mm. in length, forming a granular black spore-mass; spore-balls dark-reddish to black-brown, opaque, oblong to subspherical, more or less angular, rather firmly agglutinated, usually of about 6–20 spores, 25–45  $\mu$  in length; spores dark reddish-brown, oblong to spherical, with sides more or less angled, apparently smooth or obscurely verrucose, chiefly 10–16  $\mu$  in length.

ON CYPERACEAE:

*Rhynchospora semiplumosa*, Mississippi.

TYPE LOCALITY: Rio de Janeiro, Brazil, on *Rhynchospora glauca*.

DISTRIBUTION: Mississippi; also in South America.

#### EXCLUDED SPECIES

*Sorosporium Borrichiae* Ellis & Ev.; Millsp. Field Columb. Mus. Publ. Bot. 2: 16. 1900. On *Borrichia argentea*. = *Sterigmatocystis*.

#### 8. *THECAPHORA* Fingerh. Linnaea 10 : 230. 1835.

*Poikilosporium* Dietel, Flora 83 : 87. 1897.

Sori in various parts of the host, often as indefinite masses in the floral parts or forming rather firm pustules on the stem, at maturity with a dusty spore-mass; spore-balls composed of few to many fertile cells, rather permanently united, of small to medium large size; spores usually yellowish or reddish, smooth on contiguous sides but usually marked on the free surface; germination, so far as known, by means of a single sporidium at tip of the elongate septate promycelium.

Type, *Thecaphora hyalina* Fingerh.

Sori pustular, 2–5 mm., on various parts of hosts.

Spore-balls of 2–6 spores.

Spore-balls of 15–30 spores.

Spore-balls of 50 or more spores.

Host: *Boerhaavia*.

Host: *Cladanthrix*.

Sori indefinite, in the inflorescence.

Sori in the flower heads.

Spore-balls of 2–6 spores.

Spore-balls of 7–20 spores.

Spore-balls of 40–75 spores.

Sori inside bracts of staminate spikes.

Sori in the seeds.

1. *T. pilulaeformis*.

6. *T. mexicana*.

7. *T. tunicata*.

8. *T. Thornberi*.

2. *T. Trailii*.

3. *T. californica*.

4. *T. cuneata*.

9. *T. aterrima*.

5. *T. deformans*.

#### 1. *Thecaphora pilulaeformis* B. & C. Grevillea 3 : 58. 1874.

*Tolyposporium Davidsonii* Dietel & Holway, Bot. Gaz. 19 : 305. 1894. (Type from California, on *Isocoma veneta*; not on *Atriplex*, as stated.)

*Poikilosporium Davidsohnii* Dietel, Flora 83 : 87. 1897.

*Poecilosporium Davidsohnii* Sacc. & Sydow; Sacc. Syll. Fung. 16 : 380. 1902.

*Sorosporium Bigeloviae* Griff. Bull. Torrey Club 29 : 295. 1902. (Type from Arizona, on *Bigelovia* sp.)

Sori taking the place of the aborted inflorescence or often at the base of the leaves, subspherical, small, forming firm usually clustered pustules, upon dehiscence disclosing light-colored spore-mass; spore-balls somewhat irregular, chiefly 2–6-spored, 14–25  $\mu$  in length; spores yellowish, quite variable through pressure, oblong to polyhedral or often three-sided in cross-section, with contiguous sides flattened and smooth but with the curved free surface rather abundantly verruculose, chiefly 11–16  $\mu$  in length.

ON CARDUACEAE:

*Isocoma veneta* (*Bigelovia veneta*), California.

*Isocoma* (*Bigelovia*) sp., Arizona.

TYPE LOCALITY: California, on *Bigelovia veneta* (*Isocoma veneta*).



DISTRIBUTION : California and Arizona.

ILLUSTRATIONS : Bull. Torrey Club 29 : 295, *f.* 4 ; E. & P. Nat. Pfl. 1<sup>1</sup>\*\* : 13, *f.* 8, *C, D* ; Bot. Gaz. 19 : *pl.* 29, *f.* 5-8 ; Flora 83 : *pl.* 3, *f.* 14.

EXSICCATI : Griff. West Am. Fungi 399.

## 2. *Thecaphora Trailii* Cooke, Grevillea 11 : 155. 1883.

*Thecaphora Cirsii* Boud. Bull. Soc. Myc. Fr. 3 : 149. 1887. (Type from France, on *Cirsium anglicum*.)

*Schizonella subtrifida* Ellis & Ev. (N. Am. Fungi 2266 ; hyponym. 1889) Jour. Myc. 6 : 119. 1891. (Type from Colorado, on *Cirsium ochrocentrum*.)

*Poikilosporium Trailii* Vesterg. Micr. Rar. Sel. 452. 1902.

Sori apparently rather indefinite in the flower-heads causing more or less abortion and distortion, at maturity shedding out reddish or purplish-brown dusty spore-mass; spore-balls chiefly subspherical, composed of 2-4 or rarely 5 or 6 spores, very often separating at maturity, about 20-30  $\mu$  in diameter; spores reddish-brown, usually hemispherical or three-sided or occasionally even more irregular, with contiguous sides flat and smooth, the free surface rounded and provided with more or less evident reticulations that show at circumference as rather prominent verruculations, chiefly 12-18  $\mu$  in length.

ON CARDUACEAE :

*Carduus leiocephalus* (Utah).

*Carduus ochrocentrus* (*Cnicus ochrocentrus*), Colorado.

TYPE LOCALITY : Scotland, on *Carduus heterophyllus*.

DISTRIBUTION : Utah and Colorado; also in Europe.

ILLUSTRATION : Bull. Soc. Myc. Fr. 3 : *pl.* 15, *f.* 1.

EXSICCATI : Ellis & Ev. N. Am. Fungi 2266.

## 3. *Thecaphora californica* (Hark.) Clinton, Jour. Myc. 8 : 146. 1902.

*Sorosporium californicum* Hark. Bull. Calif. Acad. Sci. 1 : 161. 1885.

Sori rather indefinite in the flower-heads, more or less destroying the florets; spore-balls rather firm, chiefly subspherical, composed of 7-20 spores, 22-38  $\mu$  in diameter; spores light yellowish-brown, chiefly triangular to polygonal or subcircular in cross-section, with contiguous sides flat and smooth and free surfaces rounded and prominently verruculose, chiefly 11-17  $\mu$  in length.

ON CARDUACEAE :

*Grindelia robusta*, California.

TYPE LOCALITY : Antioch, California, on *Grindelia robusta*.

DISTRIBUTION : California.

EXSICCATI : Ellis & Ev. N. Am. Fungi 1495 ; Rab.-Wint. Fungi Eur. 3504.

## 4. *Thecaphora cuneata* (Schof.) Clinton, Jour. Myc. 8 : 146. 1902.

*Sorosporium cuneatum* Schof. Contr. Bot. Dep. Univ. Neb. 3 : 48. 1892.

*Sorosporium Solidaginis* Ellis & Ev. Proc. Acad. Nat. Sci. Phila. 1893 : 156. 1893. (Type from Kansas, on *Solidago missouriensis*.)

Sori rather indefinite in the flower-heads causing more or less abortion and distortion; spore-balls ovoid to subspherical, rather firm, composed of numerous (chiefly 40-75) spores, 40-80  $\mu$  in length; spores reddish-brown, in cross-section usually wedge-shaped, with outer free surface rounded and prominently verruculose, chiefly 14-22  $\mu$  in length.

ON CARDUACEAE :

*Grindelia squarrosa*, Kansas, Nebraska.

*Solidago missouriensis*, Kansas.

TYPE LOCALITY : Lincoln, Nebraska, on *Grindelia squarrosa*.

DISTRIBUTION : Kansas and Nebraska.

ILLUSTRATION : Trans. Acad. Sci. St. Louis 7 : *pl.* 27, *f.* 4, 5.

EXSICCATI : Ellis & Ev. N. Am. Fungi 3565 ; Ellis & Ev. Fungi Columb. 1282.

## 5. *Thecaphora deformans* Dur. & Mont.; Tul. Ann. Sci. Nat. III. 7 : 110. 1847.

*Thecaphora Lathyri* Kühn ; Rab. Fungi Eur. 1797. 1874.

*Thecaphora affinis* W. G. Schneid. (Jahresb. Schles. Ges. 52 : 90 ; name. 1875) ; Fisch. de Waldh. Aperçu Syst. Ust. 36. 1877. (Type from Silesia, on *Astragalus Glycyphyllos*.)

*Sorosporium Desmodii* Peck, Bot. Gaz. 3 : 35. 1878. (Type from New Jersey, on *Desmodium acuminatum*.)

*Sorosporium Astragali* Peck, Bot. Gaz. 4 : 218. 1879. (Type from Colorado, on *Astragalus Drummondii*.)

*Thecaphora Astragali* Woronin ; Farl. & Seym. Host Index N. Am. Fungi 25. 1888.

*Thecaphora Desmodii* Woronin ; Farl. & Seym. Host Index N. Am. Fungi 26. 1888.

Sori in the seeds, showing when the legumes are broken open as reddish-brown dusty spore-masses which have destroyed most of the seeds; spore-balls reddish-brown, ovoid to spherical, rather firm, composed of 3-25 (usually 7-12) spores, chiefly 27-60  $\mu$  in length; spores in optical section triangular to polygonal or when free also showing irregular oblong forms, on free surface provided with usually prominent papillae that sometimes vary to spiny processes, 15-25  $\mu$ , chiefly 15-20  $\mu$ , in length.

ON FABACEAE:

- Astragalus bisulcatus*, Colorado.  
*Astragalus Drummondii*, Colorado.  
*Astragalus missouriensis*, Utah.  
*Astragalus Nuttallianus*, Arizona.  
*Astragalus scopulorum*, Colorado.  
*Astragalus* sp., Arizona.  
*Homalobus tenellus* (*Astragalus multiflorus*), Utah.  
*Lotus humistratus*, Arizona.  
*Lotus micranthus* (*Hosackia parviflora*), Washington.  
*Lupinus* sp., Colorado.  
*Meibomia grandiflora* (*Desmodium acuminatum*), New Jersey.  
*Meibomia nudiflora* (*Desmodium nudiflorum*), Maryland, Pennsylvania.  
*Trifolium tridentatum*, California.  
*Vicia americana*, Utah.  
*Vicia caroliniana*, New York.

TYPE LOCALITY: Mascara, Algeria, on *Medicago tribuloides*.

DISTRIBUTION: New York to Maryland; Colorado to Washington and Arizona; also in Europe and Africa.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 4, f. 23; Brefeld, Unters. Gesamt. Myk. 5: pl. 11, f. 8-12.

EXSICCATI: Ellis & Ev. Fungi Columb. 136; Ellis & Ev. N. Am. Fungi 1100, 2264; Griff. West Am. Fungi 331; Seym. & Earle, Econ. Fungi C 49, C 123.

6. *Thecaphora mexicana* Ellis & Ev.; Clinton, Jour. Myc. 8: 146. 1902.

Sori on stems, prominent, forming clustered subglobose pustules each about 4 mm. in diameter, firm, upon rupture scattering dusty umber spore-mass and leaving behind the remains of the hollowed pustules; spore-balls light reddish-yellow, ovoid to spherical, composed of 15-30 spores separated by prominent hyaline areas that apparently widen with maturity, 50-90  $\mu$  in length; spores angular when young but with age becoming more rounded, irregular, oblong to polyhedral or subspherical, with distinct inner and outer coats, the latter thick and provided with prominent irregular papillae, chiefly 16-22  $\mu$ , the most elongate rarely 25  $\mu$ , in length.

ON CARDUACEAE:

*Guardiola platyphylla*, Mexico.

TYPE LOCALITY: Mexico, on *Guardiola platyphylla*.

DISTRIBUTION: Known only from the type locality.

7. *Thecaphora tunicata* Clinton, Proc. Bost. Soc. Nat. Hist. 31: 422. 1904.

Sori in the flowers, forming subspherical bodies about 2-3 mm. in diameter, enclosed by the floral envelopes, at first firm but later shedding out the granular spore-mass; spore-balls light chestnut-brown, oblong to chiefly subspherical or spherical, composed of many spores, firmly united (at least at first), chiefly 70-100  $\mu$  in length; spores subhyaline or yellowish-tinted, with free surface at least provided with a prominent deeper-colored verrucose epispore (sometimes even 3-6  $\mu$  thick), quite irregular, chiefly oblong to subspherical, 12-18  $\mu$ , or the most elongate-clavate forms even 27  $\mu$ , in length.

ON NYCTAGINACEAE:

*Boerhaavia* sp., Mexico.

TYPE LOCALITY: Chihuahua, Mexico, on *Boerhaavia* sp.

DISTRIBUTION: Known only from the type locality.

8. *Thecaphora Thornberi* Griff. Bull. Torrey Club 31: 88. 1904.

Sori in ovaries, generally clustered in the inflorescence, subspherical, about 2-5 mm. in horizontal diameter which usually slightly exceeds the vertical, upon rupture disclosing reddish granular spore-mass; spore-balls light chestnut-brown, ovoid to spherical, rather regular, very firm (at least when young), composed of many spores, chiefly 80-125  $\mu$  in length; outer spores at least covered with an evident light chestnut-colored membrane or exospore which is somewhat papillate or wrinkled on exposed surface, but inner spores



smooth and apparently hyaline, very irregular, clavate to subspherical, 12–18  $\mu$ , or the most elongate forms even 30  $\mu$ , in length.

ON AMARANTHACEAE:

*Cladothrix lanuginosa*, Arizona.

TYPE LOCALITY: Santa Rita Mountains, four miles north of Helvetia, Arizona, on *Cladothrix lanuginosa*.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATION: Bull. Torrey Club 31: 85, f. 9, 10.

#### 9. *Thecaphora aterrima* Tul. Ann. Sci. Nat. III. 7: 110. 1847.

*Sorosporium atrum* Peck, Bot. Gaz. 5: 35. 1880. (Type from Colorado, on *Carex pennsylvanica*.)  
*Tolyposporium aterrimum* Dietel, in E. & P. Nat. Pfl. 11\*\* : 14. 1897.

Sori rather indefinite, at inner base of bracts of staminate spikes, hidden from view but on removal of bracts showing as black granular spore-masses, more rarely filling the perigynia (according to Peck); spore-balls usually black-brown, opaque, ovoid to spherical, firm, composed of 2–12 or rarely more spores, 17–35  $\mu$ , rarely 50  $\mu$ , in length; spores dark reddish-brown, triangular, semipolygonal or semicircular in cross-section, more or less obscurely papillate on free surface, chiefly 10–16  $\mu$  in length.

ON CYPERACEAE:

*Carex adusta*, Iowa.

*Carex pennsylvanica*, Colorado, Kansas.

*Carex* sp., Iowa.

TYPE LOCALITY: France, on *Carex praecox*.

DISTRIBUTION: Iowa, Kansas and Colorado; also in Europe and Africa.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 4, f. 20–22; Mem. Acad. Sci. Bologna IV. 10: 703.

#### 9. *TOLYPOSPORELLA* Atk. Bull. Cornell Univ. 3<sup>1</sup>: 16. 1897.

Sori usually on the leaves, forming a black granular agglutinated coating; spore-balls variable, sometimes indefinite; spores dark-colored, provided with a very thick, often sac-like, epispore, usually of medium size; germination by a branched septate promycelium producing single lateral sporidia.

Type, *Tolyposporella Chrysopogonis* Atk.

Sori composed of definite spore-balls.

Sori composed of spores rather indefinitely agglutinated.

Sori hidden on inner surface of leaf-sheaths.

Sori on exposed surface of leaves.

1. *T. Chrysopogonis*.

2. *T. Brunkii*.

3. *T. Nolinae*.

#### 1. *Tolyposporella Chrysopogonis* Atk. Bull. Cornell Univ. 3<sup>1</sup>: 16. 1897.

Sori on inner surface of leaf-sheaths by which they are concealed, forming linear more or less merged striae of black granular-agglutinated spores; spore-balls black, opaque, more or less irregular, oblong to spherical, of many firmly agglutinated spores, 50–175  $\mu$  in length; spores dark-brown, chiefly subspherical or occasionally somewhat flattened, surrounded by a very prominently swollen and less deeply tinted sac-like envelope (of variable width and more or less sharply marked off from an inner dark thin layer), smooth, chiefly 9–12  $\mu$  in diameter exclusive of the envelope.

ON POACEAE:

*Sorghastrum avenaceum* (*Chrysopogon avenaceus*), Nebraska.

*Sorghastrum nutans* (*Chrysopogon nutans*), Alabama, Texas.

TYPE LOCALITY: Auburn, Alabama, on *Chrysopogon nutans* (*Sorghastrum nutans*).

DISTRIBUTION: Alabama and Texas.

EXSICCATI: Barth. Ellis & Ev. Fungi Columb. 1686, 2179.

#### 2. *Tolyposporella Brunkii* (Ellis & Gall.) Clinton, Jour. Myc. 8: 147. 1902.

*Ustilago* (*Sorosporium*?) *Brunkii* Ellis & Gall. Jour. Myc. 6: 31. 14 My 1890.

*Ustilago apiculata* Ellis & Gall.; Jennings, Tex. Agr. Exp. Sta. Bull. 9: 29. My 1890.

Sori on inner surface of leaf-sheaths though often showing through, forming short linear striae usually so thickly placed as to become merged into a coating of black granular spores; spores of different stages of development (the younger smaller and light-olive, the older often opaque and olive-black), more or less agglutinated but not in definite spore-balls, chiefly subspherical or spherical, obscurely granular with rather uniformly thickened epispore (2–4  $\mu$ ) which often shows faint concentric layers (innermost often marked off as an apparent endospore), chiefly 10–19  $\mu$  in diameter.

## ON POACEAE:

*Andropogon argyraeus* (*A. argenteus*), Texas.*Andropogon hirtiflorus pubiflorus*, Mexico.*Andropogon perforatus*, Mexico.*Andropogon saccharoides*, Texas; Mexico.*Andropogon saccharoides leucopogon*, Mexico.TYPE LOCALITY: College Station, Texas, on *Andropogon argenteus*.

DISTRIBUTION: Texas and Mexico.

EXSICCATI: Seym. &amp; Earle, Econ. Fungi C 127; Sydow, Ust. 204.

3. **Tolyposporella** (?) **Nolinae** Clinton, Proc. Bost. Soc. Nat.  
Hist. 31: 426. 1904.

Sori on the leaves, usually so crowded as to form a continuous and very conspicuous stratum of agglutinated black granular spores over the greater part of their surface; spore-balls rather indefinite, often apparently of two, three, or four spores adhering in various ways and often separating into single spores; spores olive-black, oblong or ovoid to spherical, flattened where in contact, with thick smooth epispore, chiefly 11–18  $\mu$  in length.

## ON DRACAENACEAE:

*Nolina microcarpa*, Arizona.TYPE LOCALITY: Rincon Mountains, Arizona, on *Nolina microcarpa*.

DISTRIBUTION: Known only from the type locality.

10. **TOLYPOSPORIUM** Woronin, Abh. Senck. Nat. Ges. 12: 577. 1882.

Sori usually in the inflorescence, more especially in the ovaries, forming a granular spore-mass at maturity; spore-balls dark-colored, composed of numerous spores permanently united, of medium size; spores bound together by ridged folds or thickenings of their outer walls, of small to medium size; germination about as in *Ustilago*.

Type, *Sorosporium Junci* Schröt.

Sori 2–5 mm. in length; spores polygonal or irregularly subspherical.

Sori occupying only an occasional ovary.

Sori usually occupying all of the ovaries.

Sori 1–2 mm. in length; spores uniformly subspherical.

1. *T. bullatum*.2. *T. globuligerum*.3. *T. Eriocauli*.

1. **Tolyposporium bullatum** Schröt. Krypt. Fl. Schles. 3<sup>1</sup>: 276. 1887.

*Sorosporium bullatum* Schröt. Abh. Schles. Ges. Abth. Nat. Med. 1869–72: 6. 1870.

Sori in ovaries, infecting occasional ones, ovate, about 3–5 mm. in length, covered with a thin greenish smooth membrane, upon rupture of which the black granular spore-mass becomes scattered; spore-balls black, opaque, oblong to spherical or polyhedral, usually containing 100 or more firmly agglutinated spores, chiefly 50–180  $\mu$  in length; spores semihyaline to light reddish-brown, covered with a thin tinted outer coat, more or less folded in ridges by which the spores are bound together and which on rupture of spore-balls often show as spiny projections at spore-margin, usually ovoid to subspherical or polyhedral, chiefly 7–10  $\mu$ , or rarely 12  $\mu$ , in length.

## ON POACEAE:

*Echinochloa Crus-galli* (*Panicum Crus-galli*), Connecticut, Illinois, Iowa, Massachusetts, Nebraska, North Carolina.TYPE LOCALITY: Silesia, on *Panicum Crus-galli* (*Echinochloa Crus-galli*).

DISTRIBUTION: New England to North Carolina and Nebraska; also in Europe.

ILLUSTRATIONS: Bot. Gaz. 19: pl. 18, f. 2–4; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 10, 40; Bull. Iowa Agr. Exp. Sta. 54: f. 120 (8); Brefeld, Unters. Gesammt. Myk. 12: pl. 9, f. 25–30; Flora 83: pl. 3, f. 13.

EXSICCATI: Ellis, N. Am. Fungi 295; Seym. &amp; Earle, Econ. Fungi C 53.

2. **Tolyposporium globuligerum** (Berk. & Br.) Ricker, Jour.  
Myc. 11: 112. 1905.

*Thecaphora globuligera* Berk. & Br. Trans. Linn. Soc. II. 1: 407. 1879.*Testicularia Leersiae* Cornu, Ann. Sci. Nat. VI. 15: 275. 1883. (Type from Algeria, on *Leersia hexandra*.)*Ustilago Leersiae* Dur.; Cornu, Ann. Sci. Nat. VI. 15: 274, as a synonym. 1883.

Sori in ovaries, apparently infecting most of those in the inflorescence, more or less hidden by the enveloping glumes, oblong to occasionally subglobose, about 2 or 3 mm. in length, covered by a rather thick smooth membrane that upon rupture discloses the black granular spore-mass; spore-balls opaque, composed of many spores, variable, chiefly ovoid



to subspherical, 85–200  $\mu$  in length; spores tinted, with darker reddish-brown folds of outer coat showing as ridges or reticulations, or upon rupture as blunt processes or spine-like projections, chiefly irregularly polygonal or subglobose, 7.5–10  $\mu$ , rarely longer.

ON POACEAE:

*Homalocenchrus hexandrus* (*Leersia hexandra*), Alabama, Texas.

TYPE LOCALITY: Brisbane, Australia, on *Leersia hexandra* (*Homalocenchrus hexandrus*). (Type from Kew examined.)

DISTRIBUTION: Alabama and Texas; also in South America, Africa and Australia.

ILLUSTRATION: Ann. Sci. Nat. VI. 15: *pl.* 14, *f.* 6–10.

### 3. *Tolyposporium Eriocauli* Clinton, *Rhodora* 3: 82. 1901.

Sori in ovaries, ovoid, somewhat two-lobed, 1–2 mm. in length, very inconspicuous in the infected heads, covered by a grayish membrane which on rupture discloses the granular spore-mass; spore-balls black, perfectly opaque, irregularly oblong to subspherical, frequently somewhat angled, firm, composed of many spores, chiefly 65–200  $\mu$  in length; spores light-colored, subspherical to spherical, adhering together by dark folds of their outer membrane which on rupture of balls show as reticulations or spine-like processes or even become entirely detached, 8–11  $\mu$  in diameter exclusive of processes.

ON ERIOCAULACEAE:

*Eriocaulon septangulare*, Connecticut, Massachusetts, New Hampshire.

TYPE LOCALITY: Ellis, Massachusetts, on *Eriocaulon septangulare*.

DISTRIBUTION: New England.

ILLUSTRATION: *Rhodora* 3: 80, *f.* 1.

EXSICCATI: Seym. & Earle, Econ. Fungi C 54.

### 11. *TESTICULARIA* Klotzsch, *Linnaea* 7: 202. 1832.

*Milleria* Peck, Ann. Rep. N. Y. State Mus. 31: 40. 1879. Not *Milleria* L. 1753.

Sori in the inflorescence, possibly limited to the ovaries, forming a conspicuous agglutinated mass of spore-balls, provided with an evident false membrane; spore-balls composed of an external layer of fertile cells within which is a central mass of sterile parenchymatous cells, of large size; spores dark-colored, apparently at length dehiscing, of medium size; germination unknown.

Type, *Testicularia Cyperi* Klotzsch.

#### 1. *Testicularia Cyperi* Klotzsch, *Linnaea* 7: 202. 1832.

*Milleria herbatica* Peck, Ann. Rep. N. Y. State Mus. 31: 40. 1879. (Type from New York, on *Rynchospora macrostachya*.)

Sori at the base of the spikelets of the inflorescence, apparently in the ovaries, one to several, forming conspicuous ovoid to subspherical tumors about 5–15 mm. in length, covered with a thick whitish false membrane that ruptures irregularly at apex and discloses a usually firmly agglutinated black granular mass of spore-balls; sterile cells of false membrane hyaline, chiefly subspherical, rather firmly bound together, about 11–17  $\mu$  in diameter, often semigelatinized; spore-balls black, chiefly ovoid to subspherical, composed of a superficial layer of numerous spores and an internal mass of thin-walled semihyaline or brownish sterile cells averaging slightly smaller than the spores, 160–375  $\mu$  in length; spores with very thick opaque wall having lighter-colored reddish-brown central part, chiefly ovoid to spherical, smooth or slightly granular, 13–16  $\mu$  in length.

ON CYPERACEAE:

*Rynchospora corniculata macrostachya* (*R. macrostachya*), New York.

TYPE LOCALITY: North America, on *Cyperaceae*.

DISTRIBUTION: Wading River, New York.

ILLUSTRATIONS: Ann. Sci. Nat. VI. 15: *pl.* 14, *f.* 1–5; *Linnaea* 7: *pl.* 9, *A.*

EXSICCATI: Ellis, N. Am. Fungi 805.





## Family 2. TILLETIACEAE

BY GEORGE PERKINS CLINTON

Sori either forming dusty erumpent spore-masses or else permanently imbedded in the tissues. Germination by means of a short promycelium which usually gives rise to a terminal cluster of elongate sporidia that, with or without fusing in pairs, produce similar or dissimilar secondary sporidia or germinate directly into infection-threads.

Spores single.

Sori dusty at maturity.

Spores without a conspicuous hyaline appendage.

Spores with an elongate hyaline appendage.

Sori permanently imbedded in the tissues.

Spores in balls.

Sori dusty; spore-balls with sterile cortex.

Sori rather permanently embedded in tissues.

Spore-balls without sterile cortex.

Spore-balls consisting entirely of dark-colored spores.

Spore-balls consisting of light-colored spores.

Spore-balls with or without central sterile cells.

Spore-balls with central network of filaments.

Spore-balls with sterile cortex.

1. TILLETIA.

2. NEOVOSSIA.

5. ENTYLOMA.

4. UROCYSTIS.

3. TUBURCINIA.

6. BURRILLIA.

8. TRACYA.

7. DOASSANSIA.

### 1. TILLETIA Tul. Ann. Sci. Nat. III. 7: 112. 1847.

Sori in various parts of the hosts, usually in the ovaries, forming a dusty spore-mass; spores single, usually formed singly in the ends of the mycelial threads that disappear more or less completely through gelatinization, of medium to large size; germination usually by a short promycelium which bears a terminal cluster of elongate sporidia that with or without fusing in pairs may, in nutrient solutions, give rise to a considerable mycelium bearing secondary air-sporidia.

Type, *Uredo Caries* DC.

Spores smooth.

Spores reticulate.

Sori 5-8 mm. in length.

Spores 16-22  $\mu$  in length.

Spores 23-28  $\mu$  in length.

Sori 3-5 mm. in length.

Sterile cells chiefly thin-walled; smaller than spores.

Spores 28-34  $\mu$  in length.

Spores chiefly 25-30  $\mu$  in length.

Spores chiefly 20-25  $\mu$  in length.

Sterile cells with very thick walls (3-6  $\mu$ ); larger than spores.

Sori 1 or 2 mm. in length.

Sterile cells chiefly thin-walled; smaller than spores.

Spores chiefly 25-30  $\mu$  in length.

Reticulations chiefly cerebriform.

Reticulations polygonal.

Spores 17-25  $\mu$  in length.

Sterile cells very thick-walled (3-8  $\mu$ ); larger than spores.

Spores apparently verruculose.

Spores with prominent tubercles, spines or scales.

Sori in the culms.

Sori in the ovaries.

Spores chiefly 18-25  $\mu$  in length.

Spores without pedicel-like projection of hyaline envelope.

Spores with prominent tubercles.

Sori 3-5 mm. in length.

Sori about 1 or 2 mm. in length.

Mature spores? but slightly tinted.

Mature spores chocolate-brown.

Host: *Bulbilis* (*Buchloe*).

Host: *Cathestecum*.

Spores with coarse scale-like appendages.

Spores with pedicel-like projection of hyaline envelope.

1. *T. foetens*.

2. *T. Tritici*.

3. *T. Elymi*.

5. *T. Muhlenbergiae*.

4. *T. Anthoxanthi*.

8. *T. fusca*.

10. *T. Redfieldiae*.

6. *T. cerebrina*.

7. *T. Airae*.

9. *T. montana*.

11. *T. asperifolia*.

12. *T. Maclagani*.

13. *T. Earlei*.

14. *T. texana*.

15. *T. Wilcoxiana*.

16. *T. buchloeana*.

17. *T. Cathesteci*.

19. *T. rugispora*.

18. *T. corona*.

Spores 25–35  $\mu$ , occasionally smaller; with coarse scales.

Sori about 3–4 mm. in length.

Completely destroying the seed.

Incompletely destroying the seed.

Sori 1 mm. or less in length.

20. *T. pulcherrima*.

21. *T. horrida*.

22. *T. Eragrostidis*.

### 1. *Tilletia foetens* (B. & C.) Trel. Par. Fungi Wisc. 35. 1884.

*Ustilago foetens* B. & C. (Rav. Fungi Car. V. 100; hyponym. 1860) Grevillea 3: 59. 1874.

*Tilletia laevis* Kühn; Rab. Fungi Eur. 1697. 1873.

Sori in ovaries, ovate or oblong, 5–8 mm. in length, more or less concealed by the glumes, all or only part of the ovaries of a spike infected; spores light- to dark-brown, oblong to chiefly subspherical or spherical, occasionally somewhat angular, foetid especially when young, smooth, chiefly 16–22  $\mu$ , the most elongate rarely 28  $\mu$ , in length.

ON POACEAE:

*Triticum vulgare*, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Jersey, North Carolina, North Dakota, Ohio, South Dakota, Wisconsin, Wyoming; Manitoba, Northwest Territory.

TYPE LOCALITY: North Carolina, on *Triticum vulgare*.

DISTRIBUTION: Coextensive with the cultivation of wheat.

ILLUSTRATIONS: Bull. N. Dak. Agr. Exp. Sta. 27: f. 2–11; Bull. Ill. Agr. Exp. Sta. 57: pl. F4, R6, T4; Bull. Kan. Agr. Exp. Sta. 8: pl. 4; Bull. Iowa Agr. Exp. Sta. 54: f. 120 (5); Ann. Rep. Mass. State Agr. Exp. Sta. 9: 248, pl. 1, f. 6.

EXSICCATI: Seym. & Earle, Econ. Fungi 79, C 50, C 51; Griff. West Am. Fungi 28, 28<sup>a</sup>, 28<sup>b</sup>; Ellis, N. Am. Fungi 1497, 3236; Ellis & Ev. Fungi Columb. 647; Rav. Fungi Car. V. 100.

### 2. *Tilletia Tritici* (Bjerk.) Wint.; Rab. Krypt. Fl. 1<sup>1</sup>: 110. 1881.

*Lycoperdon Tritici* Bjerk. K. Sv. Vet.-Acad. Handl. 36: 326. 1775.

*Uredo Caries* DC. Fl. Fr. 6: 78. 1815. (Type from France, on *Triticum vulgare*.)

*Tilletia Caries* Tul. Ann. Sci. Nat. III. 7: 113. 1847.

Sori in ovaries, ovate to oblong, 5–8 mm. in length, more or less concealed by the glumes; sterile cells few, hyaline, subspherical, with medium thin wall, smaller than spores; spores chiefly subspherical or spherical, light- to dark-brown, with winged reticulations about 1  $\mu$  high by 2–4  $\mu$  wide, 16–22  $\mu$  in diameter.

ON POACEAE:

*Triticum vulgare*, Arizona, Iowa, Kansas, Michigan, Minnesota, Montana, Nevada, New Jersey, New York, Ohio, Oregon, Washington, West Virginia.

TYPE LOCALITY: Sweden, on *Triticum hybernum* (*T. vulgare*).

DISTRIBUTION: Locally distributed wherever wheat is cultivated.

ILLUSTRATIONS: Ann. Sci. Nat. III. 7: pl. 5, f. 1–16; *ibid.* IV. 2: pl. 12, f. 1–26; Bull. Iowa Agr. Exp. Sta. 54: f. 120 (1); Brefeld, Unters. Gesamt. Myk. 5: pl. 12, f. 25–34, pl. 13; Tubeuf, Diseases Pl. f. 166, 167; Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 22; Jahrb. Wiss. Bot. 7: pl. 9, f. 1–5; Plowright, Brit. Ured. Ust. pl. 6, f. 7–13.

### 3. *Tilletia Elymi* Dietel & Holway, Bot. Gaz. 19: 305. 1894.

Sori in ovaries, oblong, about 5 or 6 mm. in length, showing between the glumes, upon rupture disclosing dark reddish-brown dusty spore-mass; spores foetid, showing different stages of development, with youngest as hyaline cells smaller than the mature spores which are chestnut-brown, chiefly subspherical or spherical, provided with evident often regular polygonal reticulations (in some varying to irregularly elongate or somewhat cerebriform), which show at circumference as more or less evident winged projections 1–3  $\mu$  in height, 23–28  $\mu$  in diameter.

ON POACEAE:

*Elymus glaucus*, Montana.

*Elymus* sp., Washington.

TYPE LOCALITY: Skamania County, Washington, on *Elymus* sp.

DISTRIBUTION: Montana and Washington.

EXSICCATI: Griff. West Am. Fungi 203; Ellis & Ev. Fungi Columb. 1486.

### 4. *Tilletia Anthoxanthi* Blytt, Forh. Vid.-Selsk. Christ.

1896<sup>6</sup>: 31. 1896.

Sori in ovaries, chiefly ovate, about 3 mm. in length, usually infecting all of the flowers of the spike and showing somewhat between the glumes, upon rupture disclosing dusty reddish-black spore-mass; sterile hyaline cells chiefly smaller than the spores, with thin to medium thick walls; spores reddish-brown, ovoid to spherical, with usually rather



regular reticulations (3–6  $\mu$  wide, projecting as winged margin 1–3  $\mu$ ), 24–30  $\mu$ , or occasionally even 34  $\mu$ , in length.

ON POACEAE:

*Anthoxanthum odoratum*, Connecticut.

TYPE LOCALITY: Norway, on *Anthoxanthum odoratum*.

DISTRIBUTION: Connecticut; also in Europe.

ILLUSTRATION: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 12, 39.

EXSICCATI: Seym. & Earle, Econ. Fungi C 124.

### 5. *Tilletia Muhlenbergiae* Clinton, sp. nov.

Sori in ovaries, apparently occupying all in the inflorescence, ellipsoidal, about 3 mm. in length, somewhat hidden by the glumes, with a greenish membrane of plant tissue at apex of which are the evident remains of the styles, easily rupturing and disclosing dusty black-brown spore-mass; sterile cells hyaline, subspherical or spherical, thin- to medium thick-walled, smaller than the spores; spores reddish to dark reddish-brown, chiefly subspherical or spherical, with very prominent polygonal winged reticulations (4–8  $\mu$  wide by about 3  $\mu$  deep), 28–34  $\mu$  in diameter.

ON POACEAE:

*Muhlenbergia Schaffneri elongata*, Mexico.

Type collected in northeastern Durango, Mexico, October, 1905, by C. G. Pringle, and communicated by E. W. D. Holway. The winged reticulations of the spores are the most prominent of any of the species reported here.

### 6. *Tilletia cerebrina* Ellis & Ev. Jour. Myc. 3: 56. 1887.

Sori in ovaries, ovoid, 1–2 mm. in length, showing somewhat through the glumes; sterile cells hyaline, smaller than the spores, with medium thick walls; spores rather dark reddish-brown, chiefly ovoid to spherical, with prominent polygonal or irregularly elongate or even cerebriform reticulations often ending in free ridges and at circumference showing as projections (1–2.5  $\mu$ , extending out to enveloping membrane), chiefly 24–30  $\mu$  in length.

ON POACEAE:

*Deschampsia caespitosa*, Rocky Mountains.

TYPE LOCALITY: Rocky Mountain region, on *Deschampsia caespitosa*.

DISTRIBUTION: Rocky Mountains.

### 7. *Tilletia Airae* Blytt, Forh. Vid.-Selsk. Christ. 1896<sup>6</sup>: 31. 1896.

Sori and spores same as in *Tilletia cerebrina*, except reticulations of spores regular instead of cerebriform.

ON POACEAE:

*Deschampsia calycina*, Oregon, Washington.

TYPE LOCALITY: Norway, on *Aira caespitosa* (*Deschampsia caespitosa*).

DISTRIBUTION: Oregon and Washington; also in Europe.

### 8. *Tilletia fusca* Ellis & Ev. Jour. Myc. 3: 55. 1887.

Sori in ovaries, oblong, 3–5 mm. long, usually showing plainly between the glumes; sterile cells hyaline, ovoid to spherical, comparatively thin-walled, small, about 14–20  $\mu$  in length; spores medium-dark reddish-brown, chiefly ovoid to spherical, occasionally slightly angled, with prominent chiefly regular reticulations (1–4  $\mu$  wide) showing at circumference as short blunt projections (about 1  $\mu$  high) so that the enveloping membrane usually closely invests the spore, chiefly 20–25  $\mu$  in length.

ON POACEAE:

*Festuca microstachya*, Washington.

*Festuca octoflora* (*F. tenella*), Idaho, Montana, Oregon, Washington, Wyoming.

TYPE LOCALITY: Rocky Mountain region, on *Festuca microstachya*.

DISTRIBUTION: Montana and Wyoming to Oregon and Washington.

EXSICCATI: Griff. West Am. Fungi 202, 202a; Seym. & Earle, Econ. Fungi C 125.

### 9. *Tilletia montana* Ellis & Ev. Jour. Myc. 3: 55. 1887.

Sori in ovaries, ovoid, about 1 mm. long, showing somewhat between and also slightly through the enveloping glumes; sterile cells hyaline, usually smaller than the spores, not very numerous, with thick wall; spores reddish-brown, ovoid to spherical, with evident hyaline enveloping membrane about 2–3  $\mu$  from spore having a papilla or thread of detach-

ment at one side, with reticulations of wall somewhat irregular forming polygonal or sometimes more elongate areas and occasionally with free ridges projecting into these, with the reticulations showing at circumference as straight projecting spines, 17–25  $\mu$  in length.

ON POACEAE:

*Sporobolus gracillimus*, Rocky Mountains.

*Sporobolus simplex*, Montana.

TYPE LOCALITY: Rocky Mountain region, on *Sporobolus gracillimus*.

DISTRIBUTION: Montana.

EXSICCATI: Griff. West Am. Fungi 226.

#### 10. *Tilletia Redfieldiae* Clinton, sp. nov.

Sori in ovaries, apparently infecting all of the spikelets, elliptical, showing prominently between the glumes, about 4–5 mm. in length; sterile cells hyaline, ovoid to subspherical but often somewhat polyhedral or irregular, with thick walls (3–6  $\mu$ ), larger than spores, sometimes even 42  $\mu$  in length; spores reddish-brown, ovoid to spherical or occasionally more elongate or angular, with rather regular polygonal reticulations that are 2.5–5  $\mu$  wide and 2–3  $\mu$  deep, chiefly 18–22  $\mu$ , or occasionally 25  $\mu$ , in length.

ON POACEAE:

*Redfieldia flexuosa*, Nebraska.

Type collected in Hooker County, Nebraska, on *Redfieldia flexuosa*, by P. A. Rydberg, July 19, 1895.

This species was originally reported as *Tilletia montana*. It is very closely related to *Tilletia asperifolia*, having the large thick-walled sterile cells of that species. It differs in having a larger sorus and apparently in the reticulations of the spores being larger and extending further out at the margin, and in the sterile cells possibly being somewhat thinner-walled. The writer is indebted for a specimen of this species to Professor Bessey.

#### 11. *Tilletia asperifolia* Ellis & Ev. Jour. Myc. 3: 55. 1887.

Sori in ovaries, ovoid, about 1 mm. in length, showing somewhat through and between the hyaline enveloping glumes, usually occurring in all the spikelets; sterile cells hyaline, chiefly ovoid to subspherical, with very thick (occasionally even 8  $\mu$ ) indistinctly laminate walls and central oil or granular contents, large, usually 25–38  $\mu$  in length; spores reddish-brown, chiefly ovoid to spherical, occasionally more elongate or somewhat angular, with rather regular polygonal reticulations that are about 2–3  $\mu$  wide extending out at the circumference about 1  $\mu$  so that the enveloping membrane is rather closely applied, chiefly 17–22  $\mu$ , rarely 25  $\mu$ , in length.

ON POACEAE:

*Sporobolus asperifolius*, Arizona, Colorado, Montana, Nevada, New Mexico, Oregon, (Utah) Washington, Wyoming.

TYPE LOCALITY: Rocky Mountain region, on *Sporobolus asperifolius*.

DISTRIBUTION: Montana to New Mexico, Arizona, and Washington.

#### 12. *Tilletia Maclagani* (Berk.) Clinton, Jour. Myc. 8: 148. 1902.

*Ustilago Maclagani* Berk. Grevillea 3: 58. 1874.

*Ustilago rotundata* Arth. Bull. Iowa Agr. Coll. Dep. Bot. 1884: 173. 1884. (Type from Iowa, on *Panicum virgatum*).

*Tilletia rotundata* Masee, Kew Bull. 1899: 145. 1899.

Sori in ovaries and occasionally in anthers, inconspicuous, concealed by the enveloping glumes, upon rupture shedding out a dusty red-brown spore-mass; spores showing different stages of development, the older light to dark reddish-brown, chiefly subspherical or spherical though occasionally more elongate or somewhat irregular, with a thick wall (3–4  $\mu$ ) apparently closely covered with verruculations (really very minutely areolately pitted), 18–27  $\mu$  in length.

ON POACEAE:

*Panicum virgatum*, Connecticut, Iowa, Kansas, Nebraska; Quebec.

TYPE LOCALITY: Montreal, Canada, on *Panicum virgatum*.

DISTRIBUTION: Quebec, Connecticut, Iowa, Kansas and Nebraska.

ILLUSTRATION: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 11.

EXSICCATI: Seym. & Earle, Econ. Fungi C 126; Ellis & Ev. N. Am. Fungi 1894.

#### 13. *Tilletia Earlei* Griff. Bull. Torrey Club 29: 290. 1902.

Sori in culms usually affecting next to upper internode, forming a somewhat swollen body 1–10 cm. in length, rupturing by longitudinal fissures which disclose a semi-dusty light-



brown spore-mass; sterile cells smaller than spores, often with thick smooth wall; spores slightly tinted to light golden-brown, chiefly subspherical or spherical, occasionally ovoid, with coarse bluntish tubercles extending out about  $2\ \mu$  to the evident hyaline envelope, chiefly  $18\text{--}22\ \mu$  in diameter.

ON POACEAE:

*Agropyron occidentale*, South Dakota.

TYPE LOCALITY: Aberdeen, South Dakota, on *Agropyron occidentale*.

DISTRIBUTION: Known only from its type locality.

ILLUSTRATION: Bull. Torrey Club 29: 291, f. 2.

EXSICCATI: Griff. West Am. Fungi 311.

14. *Tilletia texana* Long; Clinton, Jour. Myc. 8: 149. 1902.

Sori in ovaries, ovoid or oblong, about 3–5 mm. in length, often more or less hidden by enveloping glumes, forming a somewhat agglutinated light reddish-brown spore-mass; sterile cells not very numerous, hyaline, with very thick often lamellate walls and central contents; spores very light-colored, orange-yellow (appearing as if somewhat immature), chiefly subspherical or spherical, with prominent conical tubercles (blunt or sometimes quite pointed) which extend out  $2\text{--}3\ \mu$  to the evident hyaline envelope, chiefly  $19\text{--}25\ \mu$  in diameter (including envelope).

ON POACEAE:

*Hordeum nodosum* (*H. pratense*), Texas.

TYPE LOCALITY: Austin, Texas, on *Hordeum pratense* (*H. nodosum*).

DISTRIBUTION: Known only from the type locality.

15. *Tilletia Wilcoxiana* Griff. Bull. Torrey Club 31: 88. 1904.

Sori in ovaries, usually showing through the basal parts of the glumes, about 1.5–2.5 mm. in length, ovoid to ellipsoidal, frequently somewhat flattened, covered by plant membrane that usually bears the styles at its apex, upon rupture disclosing a reddish-brown spore-mass; spores slightly tinted (appearing as if immature), with evident hyaline enveloping membrane, subspherical to spherical, thick-walled with tubercles showing prominently at margin,  $18\text{--}22\ \mu$  in diameter.

ON POACEAE:

*Stipa eminens Andersoni*, California.

TYPE LOCALITY: Santa Monica, California, on *Stipa eminens Andersoni*.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATION: Bull. Torrey Club 31: 85, f. 17.

16. *Tilletia buchloeana* Kellerm. & Swingle, Jour. Myc. 5: 11. 1889.

Sori in ovaries, ovoid, 1–2 mm. in length, showing between or often concealed by enveloping glumes, with dark reddish-brown spore-mass; sterile cells hyaline, subspherical, with very thick lamellate wall and comparatively small central contents, somewhat more variable in size than the spores; spores light chocolate-brown, chiefly subspherical or spherical, with prominent short blunt tubercles often reaching only half way to outer margin of the prominent hyaline membrane which forms a band usually  $2\text{--}4\ \mu$  wide and shows papilla of attachment,  $17\text{--}22\ \mu$  in length.

ON POACEAE:

*Bulbilis dactyloides* (*Buchloe dactyloides*), Kansas.

TYPE LOCALITY: Trego County, Kansas, on *Buchloe dactyloides* (*Bulbilis dactyloides*), staminate plants.

DISTRIBUTION: Kansas.

ILLUSTRATION: Jour. Myc. 5: pl. 1, f. 1–11.

17. *Tilletia Cathesteci* (P. Henn.) Clinton, Jour. Myc. 8: 149. 1902.

*Ustilago Cathesteci* P. Henn. Hedwigia 36: 212. 1897.

Sori in ovaries, ovoid, about 1 mm. in length, often inconspicuous and with styles still attached, more or less concealed by the glumes, with black-brown spore-mass; sterile cells hyaline, with very thick wall, less common than the stages of immature spores; mature spores chocolate-brown, chiefly subspherical or spherical, with prominent conical tubercles (becoming blunt and less conspicuous with maturity) which extend out half way or more to the very evident hyaline membrane, chiefly  $19\text{--}24\ \mu$  (exclusive of envelope) in diameter.

## ON POACEAE:

*Cathestecum prostratum*, Mexico.TYPE LOCALITY: Mexico, on "*Cathestecum procumbens*" (*C. prostratum*).

DISTRIBUTION: Mexico.

18. *Tilletia corona* Scrib.; Tracy & Earle, Bull. Torrey Club

23: 210. 1896.

*Neovossia corona* Masee, Kew Bull. 1899: 156. 1899.

Sori in ovaries, ovoid or ovate, about 3–4 mm. in length, more or less exposed between the glumes; spores showing different stages of development, when mature opaque, chiefly subspherical or spherical, with evident hyaline membrane ending at one side in a short pedicel-like projection, with evident sometimes slightly curved hyaline spines (on top of spore showing as papillae) extending out to membrane and with it forming a hyaline band 1–2  $\mu$  deep, chiefly 19–25  $\mu$  in diameter.

## ON POACEAE:

*Homalocenchrus lenticularis* (*Leersia lenticularis*), Mississippi.*Homalocenchrus oryzoides* (*Leersia oryzoides*), District of Columbia, Missouri.*Homalocenchrus virginicus* (*Leersia virginica*), District of Columbia, Illinois, Mississippi, Ohio.TYPE LOCALITY: Washington, District of Columbia, on *Homalocenchrus oryzoides*.

DISTRIBUTION: District of Columbia to Missouri and Mississippi.

EXSICCATI: Ellis &amp; Ev. N. Am. Fungi 1896.

19. *Tilletia rugispora* Ellis, Jour. Myc. 7: 275. 1893.

Sori in ovaries, subspherical, inconspicuous, about 2 mm. in diameter, concealed by the glumes; sterile cells hyaline or often tinted, more or less irregular, polygonal to subspherical, thick-walled, varying from smaller to larger than the spores; mature spores dark reddish-brown, ovoid to spherical, with rather prominent tinted appendages that show at circumference as blunt scales (1–2  $\mu$ ) and on top in cross-section (1–2.5  $\mu$ ) as more or less irregular polygonal areas, 18–25  $\mu$  in length.

## ON POACEAE:

*Paspalum plicatulum*, Texas.*Paspalum* sp., Mexico.TYPE LOCALITY: College Station, Texas, on *Paspalum plicatulum*.

DISTRIBUTION: Texas and Mexico.

EXSICCATI: Ellis &amp; Ev. N. Am. Fungi 2704.

20. *Tilletia pulcherrima* Ellis & Gall.; Clinton, Proc. Bost. Soc.

Nat. Hist. 31: 441. 1904.

Sori in ovaries, ovate or more elongate and somewhat curved, extending between the spreading glumes, about 3–4 mm. in length; hyaline sterile cells medium to very thick-walled, chiefly smaller than the spores; spores showing different stages of development, the mature spores being opaque, subspherical to spherical, with more or less evident hyaline membrane and conspicuous hyaline or opaque acute or truncate scale-like projections 2  $\mu$  long (in cross-section on top of spores showing as polygonal areas), chiefly 20–30  $\mu$  in diameter.

## ON POACEAE:

*Panicum obtusum*, Arizona.*Panicum virgatum*, Illinois, Nebraska.*Syntherisma sanguinale* (*Panicum sanguinale*), Mississippi.TYPE LOCALITY: Oregon, Illinois, on *Panicum virgatum*.

DISTRIBUTION: Illinois, Mississippi, Nebraska, and Arizona.

ILLUSTRATION: Bull. Torrey Club 31: 85, f. 5, 6.

EXSICCATI: Seym. &amp; Earle, Econ. Fungi 543, C 52.

21. *Tilletia horrida* Tak. Bot. Mag. Tokyo 10: 20. 1896.

Sori in ovaries more or less destroying them, completely concealed by enveloping glumes; spores showing different stages of development, with youngest as thick-walled, hyaline cells, mature spores rather opaque, chiefly subspherical to spherical, with very coarse hyaline or slightly tinted somewhat curved scales showing at circumference of spore as a band about 2–4  $\mu$  wide and on its top in cross-section as polygonal areas 2–3  $\mu$  across, with hya-



line membrane more or less evident and often ending at one side in a short thread-like projection, 22–33  $\mu$  in length.

ON POACEAE:

*Oryza sativa*, South Carolina.

TYPE LOCALITY: Tokyo, Japan, on *Oryza sativa*.

DISTRIBUTION: South Carolina; also in Asia where rice is cultivated.

ILLUSTRATIONS: Bot. Mag. Tokyo 10: 20; Bull. S. Car. Agr. Exp. Sta. 41: f. 1–4; Bot. Gaz. 27: 468, f. 1–4.

## 22. *Tilletia Eragrostidis* Clinton & Ricker; Ricker, Jour. Myc.

11: 111. 1905.

Sori in ovaries infecting one here and there in the inflorescence, ovoid, about 1 mm. or less in length; sterile cells hyaline, ovoid to spherical, with thick lamellate walls, chiefly smaller than the spores; spores light to dark reddish-brown, often opaque, subspherical or spherical, rarely more elongate, with coarse tinted truncate scales extending out at circumference 2.5–4  $\mu$  and showing on top in cross-section as polygonal areas, 28–37  $\mu$  in length.

ON POACEAE:

*Eragrostis glomerata*, Mississippi.

TYPE LOCALITY: Yazoo City, Mississippi, on *Eragrostis glomerata*.

DISTRIBUTION: Known only from the type locality.

### DOUBTFUL AND EXCLUDED SPECIES<sup>2</sup>

*Tilletia Oryzae* Pat. Bull. Soc. Myc. Fr. 3: 124. 1887. = *Ustilaginoidea Oryzae* (Pat.) Bref., an ascomycete.

? *Tilletia* sp., resembling *Tilletia Sphagni*. On *Ricciocarpus natans*. Nature undetermined.

## 2. *NEOVOSSIA* Körn. Oesterr. Bot. Zeits. 29: 217. 1879.

*Vossia* Thüm. Oesterr. Bot. Zeits. 29: 18. 1879. Not *Vossia* Wallich & Griffith. 1836.

Sori usually in ovaries, forming a somewhat dusty spore-mass; spores simple, produced singly in the swollen ends of special fertile threads (sterigmata of Magnus) which permanently invest the spores and taper into elongate hyaline appendages, of large size; germination by a short promycelium producing numerous terminally clustered linear sporidia which germinate without conjugation and, in nutrient solutions, give rise to a mycelium producing secondary sporidia of two kinds.

Type, *Vossia Moliniae* Thüm.

### 1. *Neovossia iowensis* Hume & Hodson, Bot. Gaz. 30: 274. 1900.

Sori in ovaries, ovoid, about 2–3 mm. in length, showing between the spreading glumes, upon rupture of covering membrane disclosing a dusty black spore-mass; sterile cells or immature spores hyaline, thick-walled, chiefly smaller than the spores; spores reddish-brown, subopaque, ovoid or ellipsoidal to rarely subspherical, with prominent hyaline envelope that terminates at one end in a tapering irregular tail about twice the length of the spore, the cell-wall minutely reticulate-pitted, 19–28  $\mu \times$  13–19  $\mu$ .

ON POACEAE:

*Phragmites Phragmites* (*P. communis*), Connecticut, Iowa.

TYPE LOCALITY: Colo, Iowa, on *Phragmites communis* (*P. Phragmites*).

DISTRIBUTION: Connecticut and Iowa.

ILLUSTRATIONS: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 13; Bull. Iowa Agr. Exp. Sta. 54: f. 122; Bot. Gaz. 30: 274, f. 1.

EXSICCATI: Seym. & Earle, Econ. Fungi C 113.

## 3. *TUBURCINIA* [Fries] Woronin, Abh. Senck. Nat. Ges. 12: 561. 1882.

Sori usually in the leaves or stem, forming dark-colored often papillate areas, rather permanently embedded in the tissues; spore-balls composed entirely of firmly united fertile cells, of medium size; spores usually dark-colored, variable, of medium size; sometimes preceded by conidia, forming a conspicuous white growth on the surface of leaves, hyaline, oblong to ovate.

Type, *Tuburcinia Trientalis* B. & Br.

Spore-balls of 6 to many spores; 27–75  $\mu$  in length.

Spore-balls of 10 to many spores; 45–100  $\mu$  in length.

1. *T. Clintoniae*.
2. *T. Trientalis*.

1. *Tuburcinia Clintoniae* Kom.; Jacz.-Kom.-Tranz. Fungi  
Rossiae 260. 1899.

Sori in leaves, oval to subcircular, about 2-5 mm. in length, forming flat minutely granular agglutinated black areas showing on both sides, permanently covered by the epidermis; spore-balls dark reddish-brown, ovoid to spherical, often surrounded by an inconspicuous covering of sterile threads, firm, of 6 to many spores, 27-75  $\mu$  in length; spores reddish-brown, variable, somewhat oblong or cuneate to chiefly polygonal in cross-section, smooth, 12-18  $\mu$  in length; conidial stage unknown.

ON CONVALLARIACEAE:

*Streptopus roseus*, British Columbia.

*Vagnera stellata* (*Smilacina stellata*), Wisconsin.

TYPE LOCALITY: Siberia, on *Clintonia udensis*.

DISTRIBUTION: Wisconsin and British Columbia; also in Europe.

EXSICCATI: Ellis, Ev. & Barth. Fungi Columb. 1789; Seym. & Earle, Econ. Fungi C 128.

2. *Tuburcinia Trientalis* B. & Br. Ann. Mag. Nat. Hist.  
II. 5: 464. 1850.

*Ascomyces Trientalis* Berk. Outl. Brit. Fungi 376. 1860. [Conidial stage.]

*Sorosporium Trientalis* Woronin; Fisch. de Waldh. Aperçu Syst. Ust. 32. 1877.

Sori on leaves, petioles and stems, variable, often pustular, on stems frequently forming areas of considerable extent, sometimes erumpent; spore-balls reddish-brown, irregular, oblong to subspherical, firm, usually with little evidence of sterile envelope, composed of 10 to many spores, 45-100  $\mu$  in length; spores reddish-brown, oblong to polyhedral, smooth, 14-22  $\mu$  in length; conidial stage forming a dense, white, epiphyllous coating usually over entire leaf, with hyaline, thin-walled, oblong to ovate conidia about 11-14  $\mu \times 5-7 \mu$ .

ON PRIMULACEAE:

*Trientalis arctica* (*T. europaea*), Alaska.

TYPE LOCALITY: Aberdeen, Scotland, on *Trientalis europaea*.

DISTRIBUTION: Alaska; also in Europe.

ILLUSTRATION: Abh. Senck. Nat. Ges. 12: 559.

4. *UROCYSTIS* Rab.; Klotzsch, Herb. Viv. Myc. ed. 2. 393. 1856.

*Polycystis* Lév. Ann. Sci. Nat. III. 5: 269. My 1846. Not *Polycystis* Kütz. Ja 1846.

Sori usually in the leaves or stems, occasionally in other parts, producing dark-colored usually dusty spore-masses; spore-balls permanent, composed of an enveloping cortex of tinted sterile cells and usually one to several interior fertile cells, of small to medium size; spores generally dark-colored, variable, of medium size; germination by a short promycelium producing terminally grouped sporidia which give rise to similar secondary sporidia or to infection-threads.

Type, *Erysibe occulta* Wallr.

Sori in leaves, petioles or stems.

Spore-balls without a true cortex.

Spore-balls with a true cortex.

Spores usually 1-5 in the balls.

Cortical cells incompletely covering spores.

Cortical cells rather completely covering spores.

Spores usually 4-8 in the balls.

Cortical cells 8-15  $\mu$ ; spore-balls 30-60  $\mu$ , rarely 90  $\mu$ .

Cortical cells 6-10  $\mu$ ; spore-balls chiefly 28-55  $\mu$ .

Spores usually 1, rarely 2, in the balls.

Cortical cells 6-10  $\mu$ , rarely 12  $\mu$ .

Cortical cells usually 4-8  $\mu$ .

Spores usually 1 or 2, rarely 3 or 4, in the balls.

Sori in areas or pustules.

Sori in striae.

Cortical cells incompletely covering spores.

Cortical cells completely covering spores.

Sori in the culm filling the interior.

Sori in the inflorescence.

Sori in the spikelets.

Sori in the flowers and pedicels.

1. *U. Waldsteiniae*.

2. *U. Anemones*.

3. *U. carcinodes*.

4. *U. sorosporioides*.

5. *U. Violae*.

6. *U. Lithophragmae*.

7. *U. Cepulae*.

8. *U. Colchici*.

9. *U. occulta*.

10. *U. Agropyri*.

11. *U. Junci*.

12. *U. granulosa*.

13. *U. Hypoxyis*.



1. *Urocystis Waldsteiniae* Peck, Ann. Rep. N. Y. State Mus.

46 : 112. 1893.

*Ustilago Waldsteiniae* Paz.; Rab.-Wint.-Paz. Fungi Eur. 4011. 1895.*Urocystis Gei* Ellis & Ev. Bull. Torrey Club 27 : 572. 1900. (Type from Washington, on *Geum ciliatum*.)

Sori on leaves, epiphyllous, oval to linear, forming pustules that follow the veins and are covered at first by a false indusium that dehisces through the center and spreads back on either side disclosing the olive-black dusty spore-mass; sterile cells apparently lacking; spores simple or often adhering rather temporarily together in pairs or groups of 3 or 4, reddish-brown, rather irregular, oblong to polyhedral or often subspherical, smooth, 9–14  $\mu$ , occasionally 16  $\mu$ , in length.

## ON ROSACEAE :

*Sieversia ciliata* (*Geum ciliatum*), Washington.*Waldsteinia fragarioides*, New York, Wisconsin; Canada.TYPE LOCALITY : Alcove, New York, on *Waldsteinia fragarioides*.

DISTRIBUTION : Canada, New York, Wisconsin, and Washington.

EXSICCATI : Ellis &amp; Ev. Fungi Columb. 137, 1595; Shear, N. Y. Fungi 86; Ellis &amp; Ev. N. Am. Fungi 2983; Sydow, Ust. 248; Seym. &amp; Earle, Econ. Fungi C 62; Rab.-Wint.-Paz. Fungi Eur. 4011.

The generic position of this species is unsettled, but it is placed here until further study determines its place.

2. *Urocystis Anemones* (Pers.) Wint.; Rab. Krypt. Fl. 1<sup>1</sup> : 123. 1881.*Uredo Anemones* Pers. Tent. Disp. Fung. 56. 1797.*Caeoma pompholygodes* Schlecht. Linnaea 1 : 248. 1826.*Urocystis pompholygodes* Rab. Fungi Eur. 697. 1864.

Sori in leaves, petioles, and stems, forming conspicuous pustules of varying shape and size, upon rupture disclosing a dusty brown-black spore-mass; spore-balls irregular, apparently separating somewhat into the sterile cells and spores, usually 22–35  $\mu$ , rarely 45  $\mu$ , in length; sterile cells usually incompletely covering the spores, often only on one side, smoky-brown or yellowish-tinted, ovoid to spherical, usually thin-walled, about 8–14  $\mu$  in length; spores reddish-brown, irregular, oblong or ovoid to polyhedral or subspherical, smooth, 1–5 though usually only 1 or 2 in a ball, chiefly 12–17  $\mu$ , the most elongate rarely 20  $\mu$ , in length.

## ON RANUNCULACEAE :

*Anemone canadensis* (*A. pennsylvanica*), New York, Wisconsin.*Anemone caroliniana*, Kansas, Texas.*Anemone decapetala*, Kansas, Texas.*Anemone quinquefolia* (*A. nemorosa*), Connecticut, Iowa, Maine, Massachusetts, Michigan, New York, Wisconsin.*Anemone virginiana*, Iowa, New York, Texas.*Cyrtorhyncha ranunculina*, Wyoming.*Hepatica acuta* (*H. acutiloba*), Illinois, Indiana, Iowa, Minnesota, New York, Wisconsin.*Hepatica Hepatica* (*H. triloba*), Missouri.*Pulsatilla hirsutissima* (*Anemone patens Nuttalliana*), Colorado, New Mexico.*Ranunculus digitatus*, Utah.*Ranunculus Eschscholtzii*, Utah.*Ranunculus fascicularis*, Illinois.*Ranunculus stenolobus*, Utah.*Ranunculus* sp., Wyoming.*Syndesmon thalictroides* (*Anemonella thalictroides*), New York.*Trollius* sp., New York.TYPE LOCALITY : Europe, on *Anemone nemorosa*.

DISTRIBUTION : New England to Minnesota, Utah and Texas; also in South America, Europe and Asia.

ILLUSTRATIONS : Ann. Rep. Conn. Agr. Exp. Sta. 1889 : pl. 2, f. 7, 8; E. & P. Nat. Pfl. 11\*\* : 20, f. 12 D; Brefeld, Unters. Gesamt. Myk. 12 : pl. 11, f. 2; Bull. Soc. Nat. Mosc. 40<sup>1</sup> : pl. 3, f. 26; Jahrb. Wiss. Bot. 7 : pl. 12, f. 38–43; Plowright, Brit. Ured. Ust. pl. 7, f. 31–33.

EXSICCATI : Ellis &amp; Ev. Fungi Columb. 475, 1689; Ellis, N. Am. Fungi 294; Seym. &amp; Earle, Econ. Fungi C 59, C 60, C 129, C 130.

3. *Urocystis carcinodes* (B. & C.) Fisch. de Waldh. Aperçu

Syst. Ust. 38. 1877.

*Thecaphora carcinodes* B. & C. Grevillea 3 : 58. 1874.

Sori on stems, petioles, or midribs, rarely on blades, forming very conspicuous out-breaks that cause considerable distortion of infected parts, upon rupture disclosing a dusty

brown-black spore-mass; spore-balls ovoid to subspherical, firm, chiefly 25–45  $\mu$  in length; sterile cells hyaline or yellowish-tinted, ovoid to subspherical, usually completely covering the spores, often thick-walled, 6–12  $\mu$  in length; spores reddish-brown, ovoid to subspherical or polyhedral, smooth, generally 1–6 in a ball, usually 12–16  $\mu$  in length.

ON RANUNCULACEAE:

*Actaea alba*, West Virginia.

*Actaea arguta*, Utah.

*Actaea* sp., Pennsylvania.

*Atragene occidentalis*, Utah.

*Cimicifuga racemosa*, North Carolina, Ohio, Pennsylvania, Tennessee.

TYPE LOCALITY: Pennsylvania, on *Cimicifuga racemosa*.

DISTRIBUTION: Pennsylvania to North Carolina and Utah.

EXSICCATI: Ellis, Ev. & Barth. Fungi Columb. 1891; Seym. & Earle, Econ. Fungi C 131; Kellerm. Ohio Fungi 79.

4. *Urocystis sorosporioides* Körn.; (Fuckel, Jahrb. Nass. Ver. Nat. 29–30: 10; hyponym. 1875) Fisch. de Waldh. Aperçu Syst. Ust. 41. 1877.

Sori on stems, petioles, and leaves, usually forming pustules of considerable size and causing more or less distortion to host, upon rupture disclosing a dusty brown-black spore-mass; spore-balls dark reddish-brown, irregular, oblong to subspherical, firm, chiefly 30–60  $\mu$ , rarely 90  $\mu$ , in length; sterile cells smoky or yellowish-tinted, usually completely covering spores, ovoid to subspherical, 8–15  $\mu$  in length; spores reddish-brown, oblong to polyhedral or subspherical, usually 4–12, rarely 1–3, smooth, chiefly 13–17  $\mu$ , the most elongate rarely 22  $\mu$ , in length.

ON RANUNCULACEAE:

*Aconitum columbianum*, Utah.

*Aquilegia flavescens*, Utah.

*Aquilegia leptocera*, Utah.

*Delphinium scopulorum*, —.

*Delphinium* sp., California.

*Thalictrum alpinum*, Greenland.

*Thalictrum Fendleri*, Utah.

*Thalictrum sparsiflorum*, Utah.

*Thalictrum* sp., Arizona, Massachusetts.

TYPE LOCALITY: Bonn, Germany, on *Thalictrum minus*.

DISTRIBUTION: Greenland, Massachusetts, Utah, Arizona, and California; also in Europe.

5. *Urocystis Violae* (Sow.) Fisch. de Waldh. Bull. Soc. Nat. Mosc. 40<sup>1</sup>: 258. 1867.

*Granularia Violae* Sow. Engl. Fungi pl. 440. 1815.

Sori on stems, exposed rootstocks, petioles and veins of leaves, forming prominent irregular swellings often several cm. in length, rather permanently covered by the tissues but upon rupture disclosing a black-brown spore-mass; spore-balls reddish-brown, rather irregular, oblong to subspherical, chiefly 28–55  $\mu$  in length; sterile cells yellowish-tinted, with age sometimes becoming rather obscure, small, 6–10  $\mu$  in length; spores light reddish-brown, ovoid to spherical or polyhedral, chiefly 4–8 in a ball, mostly 11–15  $\mu$  in length.

ON VIOLACEAE:

*Viola odorata*, Canada.

*Viola* spp., Minnesota, Utah.

TYPE LOCALITY: Dorking, England, on *Viola* sp.

DISTRIBUTION: Canada, Minnesota, and Utah; also in Europe.

ILLUSTRATIONS: E. & P. Nat. Pfl. 11<sup>\*\*</sup>: 20, f. 12 A–C; Brefeld, Unters. Gesamt. Myk. 12: pl. 11, f. 9–15; Tubeuf, Diseases Pl. f. 174; Ann. Sci. Nat. VI. 10: pl. 1, f. 1–18, 25–31.

6. *Urocystis Lithophragmae* Garrett, sp. nov.

Sori in the leaves and petioles, more or less distorting them into dusty black powdery masses, at first covered by a whitish membrane of plant tissues; spore-balls chiefly subspherical, with cortex of sterile cells partially or rather completely covering the fertile cells, chiefly 20–30  $\mu$  in length; sterile cells ovoid to chiefly subspherical or spherical, olive-brown tinted, rather small, 6–10  $\mu$ , or the most elongate even 12  $\mu$ , in length; spores usually 1, rarely 2, reddish-brown, subspherical, chiefly 12–16  $\mu$  in length.



## ON SAXIFRAGACEAE:

*Lithophragma bulbifera*, Utah

Type collected in Alta Valley, Little Cottonwood Cañon, Salt Lake County, Utah, on *Lithophragma bulbifera*, by A. O. Garrett, July, 1905. Apparently this is the only smut so far reported on the Saxifragaceae.

7. *Urocystis Cepulae* Frost; Farl. Ann. Rep. Sec. Mass. Board Agr.  
24: App. 175. 1877.

*Urocystis Colchici Cepulae* Cooke, Gard. Chron. II. 7: 635. 1877.

Sori in leaves, forming isolated pustules or often affecting them for the greater part of their length and breadth, sometimes occurring at their base in the bulbs, upon rupture of covering membrane disclosing a dusty black-brown spore-mass; spore-balls ovoid to spherical, small, 17-25  $\mu$  in length; sterile cells tinted, ovoid to spherical, small, rather completely covering the spores, usually 4-8  $\mu$  in length; spores reddish-brown, ovoid to spherical, usually 1, rarely 2 in a ball, chiefly 12-16  $\mu$  in length.

## ON ALLIACEAE:

*Allium Ceba*, Connecticut, Indiana, Kansas, Massachusetts, New Jersey, New York, Ohio, Vermont.

*Allium nevadense*, Nevada.

TYPE LOCALITY: Green's Farms, Connecticut, on *Allium Ceba*.

DISTRIBUTION: Eastern United States where onions are in cultivation; Nevada; also in Europe.

ILLUSTRATIONS: Ann. Rep. Conn. Agr. Exp. Sta. 1889: pl. 1, 2, f. 1, 2, 18-28; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 14, 42; Ann. Rep. Sec. Mass. Board Agr. 24: App. frontisp. f. 4, 5.

EXSICCATI: Ellis & Ev. N. Am. Fungi 2706; Seym. & Earle, Econ. Fungi C 61, C 132.

8. *Urocystis Colchici* (Schlecht.) Rab. Fungi Eur. 396. 1861.

*Caecoma Colchici* Schlecht. Linnaea 1: 241. 1826.

Sori in leaves, forming slightly elevated areas of varying size and shape, showing through on both sides, at first covered by epidermis and lead-colored but eventually rupturing this and disclosing a granular reddish-black spore-mass; spore-balls dark reddish-brown, consisting of 1-3 or rarely 4 spores surrounded rather completely by a cortex of tinted, thick-walled ovoid to subspherical sterile cells (7-13  $\mu$ ), 20-40  $\mu$  in length; spores medium-dark reddish-brown, irregular oblong to ovoid or subspherical, flattened where in contact, 12-20  $\mu$  in length.

## ON CONVALLARIACEAE:

*Salomonina commutata* (*Polygonatum giganteum*), Iowa.

*Vagnera amplexicaulis* (*Smilacina amplexicaulis*), Montana.

*Vagnera stellata* (*Smilacina stellata*), Montana.

TYPE LOCALITY: Black Forest Mountains (Hercynia) Europe, on *Colchicum autumnale*.

DISTRIBUTION: Iowa and Montana; also in Europe.

ILLUSTRATIONS: Ann. Rep. Conn. Agr. Exp. Sta. 1889: pl. 2, f. 3, 4; Ann. Sci. Nat. VI. 10: pl. 1, f. 19-24, 32; Bot. Zeit. 59: 150.

9. *Urocystis occulta* (Wallr.) Rab.; Klotzsch, Herb. Viv. Myc.  
ed. 2. 393. 1856.

*Erysibe occulta* Wallr. Fl. Crypt. Germ. 2: 212. 1833.

Sori in leaves (especially on inner side of sheaths), culm and inflorescence, forming linear striae usually of great length and often merged into a continuous stratum of dusty reddish-black spore-balls; spore-balls oblong to subspherical, 16-32  $\mu$  in length; sterile cells often incompletely covering the spores, hyaline or yellowish-tinted, subspherical to oblong, usually with distended and uniformly thickened walls; spores reddish-brown, oblong to subspherical, often with sides flattened, smooth, 1 or 2, rarely 3 or 4 in a ball, 11-18  $\mu$  in length.

## ON POACEAE:

*Secale cereale*, Connecticut, Massachusetts, Minnesota, New Jersey, New York, Ohio, Rhode Island; Nova Scotia.

TYPE LOCALITY: Germany, on *Secale cereale*.

DISTRIBUTION: Nova Scotia to Minnesota and New Jersey; also in South America, Europe, and Australia.

ILLUSTRATIONS: Ann. Rep. Conn. Agr. Exp. Sta. 1889: pl. 2, f. 9-11; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 15, 41; Bull. Iowa Agr. Exp. Sta. 54: f. 120 (9); Ann. Rep. Mass. State Agr. Exp. Sta. 9: 248, pl. 1, f. 4; Brefeld, Unters. Gesamt. Myk. 12: pl. 11, f. 1; Tubeuf, Diseases Pl. f. 172; Bull. Soc. Nat. Mosc. 40: pl. 3, f. 27; Bot. Zeit. 31: pl. 7.

EXSICCATI: Ellis, N. Am. Fungi 292; Underw. & Cook, Illustr. Fungi 57; Seym. & Earle, Econ. Fungi 98; Kellerm. Ohio Fungi 34.

10. *Urocystis Agropyri* (Preuss) Schröt. Abh. Schles. Ges. Abth.  
Nat. Med. 1869-72 : 7. 1870.

*Uredo Agropyri* Preuss, in Sturm, Deuts. Fl. III. 25: 1. 1848.

*Urocystis Preussii* Kühn; Rab. Fungi Eur. 1898. 1874.

*Urocystis Ulii* Magn.; Rab. Fungi Eur. 2390. 1878. (Type from Germany, on *Poa pratensis angustifolia*.)

*Urocystis occulta Tritici* Ellis, N. Am. Fungi 293. 1879.

*Urocystis Festucae* Ule, Abh. Bot. Ver. Prov. Brand. 25: 215. 1884. (Type from Germany, on *Festuca ovina*.)

Sori in various parts, most commonly in leaves, forming striae a few mm. to length of leaf, distinct or covering surface of leaf, at first lead-colored and protected by epidermis but soon rupturing and reddish-brown spores becoming scattered; spore-balls oblong to subspherical, 16-32  $\mu$  in length; sterile cells hyaline to yellowish, oblong to subspherical, usually completely covering fertile cells, outer wall apparently thin and by collapsing with age giving ridged effect to the covering; spores 1 or 2, rarely 3 or 4 in a ball, reddish-brown, oblong to subspherical, often with flattened sides, smooth, 11-18  $\mu$  in length.

ON POACEAE:

*Agropyron divergens*, Washington.

*Agropyron occidentale*, New Mexico.

*Agropyron repens*, Connecticut, Massachusetts, Vermont.

*Bromus ciliatus*, Iowa.

*Bromus* sp., Minnesota.

*Calamagrostis canadensis*, Oregon.

*Elymus arenarius*, Greenland.

*Elymus canadensis*, Illinois, Iowa, Kansas, Missouri, Nebraska, Wisconsin.

*Elymus robustus*, Iowa.

*Elymus virginicus*, Illinois, Wisconsin.

*Elymus* sp., Colorado, Minnesota.

TYPE LOCALITY: Hoyerswerda, Germany, on *Agropyron repens*.

DISTRIBUTION: New England to New Mexico, Oregon, and northward; also in Europe.

ILLUSTRATIONS: Bull. Iowa Agr. Exp. Sta. 54: f. 120 (10, 13); Bull. Soc. Nat. Mosc. 40<sup>1</sup>: pl. 3, f. 28.

EXSICCATI: Seym. & Earle, Econ. Fungi 99, 100, C56, C57, C58; Ellis, Ev. & Barth, Fungi Columb. 1988; Sydow, Ust. 339; Griff. West Am. Fungi 222; Ellis, N. Am. Fungi 293.

11. *Urocystis Junci* Lagerh. Bot. Notiser 1888: 201. 1888.

Sori in the culms, filling the interior, eventually rupturing and disclosing a dusty brown-black spore-mass; spore-balls variable, chiefly of 1-8 spores but rarely of more, 16-36  $\mu$ , or occasionally 50  $\mu$ , in length; sterile cells dark reddish-brown, easily collapsing and then showing as a prominent reticulate envelope completely covering the spores, about 5-9  $\mu$  in diameter; spores reddish-brown, chiefly subspherical or occasionally somewhat flattened through pressure and then more elongate, 11-16  $\mu$  in length.

ON JUNCACEAE:

*Juncus balticus*, Nevada.

TYPE LOCALITY: Near Pontresina, Switzerland, on *Juncus filiformis*.

DISTRIBUTION: Nevada; also in Europe.

EXSICCATI: Griff. West Am. Fungi 221.

12. *Urocystis granulosa* Clinton, Jour. Myc. 8: 151. 1902.

Sori in the spikelets, ovoid or oblong, about 5-10 mm. in length, chiefly confined to the inner parts but showing through the more or less infected glumes, forming a granular black spore-mass; spore-balls reddish- to black-brown, ovoid to spherical, not easily ruptured, chiefly 28-50  $\mu$  in length; sterile cells reddish-yellow, ovoid to subspherical, completely covering the spores, often somewhat indefinite in appearance through the collapsing of the outer wall, about 8-13  $\mu$  in length; spores dark reddish-brown, ovoid to spherical, or polyhedral through pressure, smooth, 1-6 or rarely more in a ball, about 13-19  $\mu$  in length.

ON POACEAE:

*Stipa comata*, Idaho.

TYPE LOCALITY: Idaho, on *Stipa comata*.

DISTRIBUTION: Known only from the type locality.



13. *Urocystis Hypoxis* Thaxter, Ann. Rep. Conn. Agr. Exp.  
Sta. 1889: *sub pl. 2.* 1890.

Sori in the flowers, more or less distorting and destroying the inner parts, often extending down on pedicels and peduncles for a short distance, somewhat irregular, oblong, about 1-2 cm. in length, upon rupture of protecting parts disclosing a purple-black dusty spore-mass; spore-balls chiefly ovoid to spherical, 25-60  $\mu$  in length; sterile cells reddish-yellow, completely covering the spores, ovoid, about 9-14  $\mu$  in length; spores reddish-brown, polyhedral to subspherical or spherical, occasionally ovoid to oblong, 1-8, chiefly 3-5, in a ball, usually 13-16  $\mu$  in length.

ON AMARYLLIDACEAE:

*Hypoxis hirsuta* (*H. erecta*), Connecticut, Massachusetts.

TYPE LOCALITY: New Haven (West Rock Park), Connecticut, on *Hypoxis erecta* (*H. hirsuta*).

DISTRIBUTION: Connecticut and Massachusetts; also in South America.

ILLUSTRATION: Ann. Rep. Conn. Agr. Exp. Sta. 1889: *pl. 2, f. 12-14.*

EXSICCATI: Ellis & Ev. N. Am. Fungi 2688; Selys & Earle, Econ. Fungi C 133.

5. *ENTYLOMA* DeBary, Bot. Zeit. 32: 101. 1874.

*Rhamphospora* D. D. Cunn. Sci. Mem. Med. Off. Army India 3: 32. 1888.

Sori usually in the leaves, generally forming discolored but little distorted areas, permanently embedded in the tissues; spores single, produced terminally or intercalary in the fertile mycelium which does not entirely disappear through gelatinization, free (sometimes irregularly adhering through pressure), hyaline to yellowish or reddish-yellow, occasionally dark-colored, of medium size; germination by a short promycelium bearing a terminal group of sporidia which usually conjugate in pairs and produce secondary sporidia or infection-threads; conidia often present, formed by germination of the spores *in situ* or on the mycelium, protruding through the stomata, hyaline, usually elongate.

Type, *Protomyces microsporus* Ung.

Sori black; spores tinted reddish-brown, often adhering together.

Spores chiefly 8-14  $\mu$  in length.

Sori forming oblong to linear striae.

Spores 7-11  $\mu$  in length.

Spores 8-14  $\mu$  in length.

Spores chiefly regular.

Spores often irregular and elongate.

Sori often fusing to form a continuous stratum.

Spores chiefly 15-22  $\mu$  in length.

Sori white to reddish-brown; spores hyaline or yellowish-tinted.

Spores not apiculate, often adhering somewhat.

Sori thin — in the unthickened tissues.

Conidia or sporidia hypophyllous.

Spores chiefly 8-13  $\mu$  in length, thin-walled (see also no. 16).

Sori angular.

Sori without evident hypophyllous growth.

Sori with evident hypophyllous growth.

Hosts: Ambrosiaceae, Carduaceae, Cichoriaceae.

Hosts: Menispermaceae.

Sori circular.

Spores chiefly 11-16  $\mu$  in length, thick-walled.

Spore-walls evidently double.

Spore-walls not papillate.

Spore-walls, occasionally, with evident papillae.

Double walls of spores not very evident.

Sori rather conspicuous, 2-5 mm. or even larger.

Sori yellowish above, white beneath; spores often 9-12  $\mu$ .

Sori yellowish or reddish-brown, often bordered.

Sori small, usually less than 2 mm. in diameter.

Sori angular, usually with evident whitish growths.

Sori chiefly subcircular.

Spores chiefly 14-19  $\mu$  in length.

Spores regular, subspherical.

Spores ovoid to subspherical, often angular.

Conidia lacking or not observed.

Hosts: Ambrosiaceae, Carduaceae.

Sori often indefinite.

1. *E. lineatum*.

2. *E. crastophilum*.

3. *E. irregulare*.

4. *E. speciosum*.

5. *E. caricinum*.

6. *E. Thalictri*.

9. *E. compositarum*.

8. *E. Menispermii*.

14. *E. Floerkeae*.

7. *E. Ranunculi*.

12. *E. arnicale*.

16. *E. Lobeliae*.

17. *E. australe*.

19. *E. Saniculae*.

21. *E. Linariae*.

22. *E. Ellisii*.

24. *E. fuscum*.

10. *E. polysporum*.

- Sori conspicuous, reddish-brown. 11. *E. Holwayi*.  
 Sori often concavo-convex. 13. *E. guaraniticum*.  
 Hosts: not Ambrosiaceae nor Carduaceae.  
 Sori showing on both surfaces of leaves.  
 Spores often with hyphal pedicels. 15. *E. Collinsiae*.  
 Spores without hyphal pedicels.  
 Sori subcircular, conspicuous, 2 mm. or more. 18. *E. serotinum*.  
 Sori angular, often indefinite, less than 2 mm. 20. *E. Eryngii*.  
 Sori small, usually bordered. 23. *E. Eschscholtziae*.  
 Sori hypophyllous only. 21. *E. Linariae*.  
 Sori forming hard pustules, often concavo-convex. 25. *E. microsporum*.  
 Spores apiculate and pedicellate, never adhering. 26. *E. Nymphaeae*.

1. **Entyloma lineatum** (Cooke) Davis, Trans. Wisc. Acad.

9 : 162. 1893.

*Ustilago lineata* Cooke; (Rav. Fungi Am. 789; hyponym. 1882) Sacc. Syll. 7 : 456. 1888.  
*Entyloma Pammelii* Hume, Proc. Iowa Acad. Sci. 9 : 238. 1902. (Type from Iowa, on *Zizania aquatica*.)

Sori in the leaves, leaf-sheaths, and culms, small, 0.5–3 mm. in length, subcircular to linear, scattered or fusing though even then not always completely losing their individuality, lead-colored, rather permanently covered by epidermis; spores light golden-brown, firmly agglutinated, usually ovoid to subspherical or somewhat polyhedral, smooth, chiefly 7–11  $\mu$  in length.

ON POACEAE :

*Zizania aquatica*, Connecticut, Georgia, Illinois, Iowa, Nebraska, South Dakota, Wisconsin.

TYPE LOCALITY : Darien, Georgia, on *Zizania aquatica*.

DISTRIBUTION : Connecticut; Georgia; Illinois to South Dakota.

ILLUSTRATION : Bull. Conn. Geol. Nat. Hist. Surv. 5 : f. 16, 32.

EXSICCATI : Seym. & Earle, Econ. Fungi C 21; Rav. Fungi Am. 789; Ellis, N. Am. Fungi 1097; Ellis & Ev. Fungi Columb. 134; Griff. West Am. Fungi 16.

2. **Entyloma crastophilum** Sacc. Michelia 1 : 540. 1879.

Sori in leaves, subcircular to linear, about 0.25–2 mm. in length, usually distinct though occasionally merged, black, long covered by epidermis; spores rather dark-brown, tightly packed and more or less adhering together, chiefly ovoid to spherical or angled through pressure, rather thick-walled, 8–14  $\mu$  in length.

ON POACEAE :

*Agrostis alba vulgaris*, Wisconsin.

*Catabrosa aquatica* (Utah)

*Holcus lanatus*, Connecticut, New York.

*Phleum pratense*, Illinois, Iowa.

TYPE LOCALITY : Mantua, Italy, on *Poa annua*.

DISTRIBUTION : Connecticut, New York, Wisconsin, Illinois, Iowa, and Utah; also in South America and Europe.

3. **Entyloma irregulare** Johans. Oefv. K. Sv. Vet.-Akad.

Förh. 41<sup>9</sup> : 159. 1885.

Sori in leaves, subcircular to oblong, about 1 mm., distinct or somewhat merging into one another, lead-colored, long covered by epidermis; spores almost colorless to very light-brown, very irregular to subspherical or polyhedral, chiefly 8–14  $\mu$ , the most elongate occasionally 17  $\mu$ , in length; conidia often present in very small white clusters on sori.

ON POACEAE :

*Poa pratensis*, Illinois.

TYPE LOCALITY : Iceland, on *Poa annua*.

DISTRIBUTION : Illinois; also in Europe.

4. **Entyloma speciosum** Schröt. & P. Henn. Hedwigia 35 : 220. 1896.

Sori in the leaves, oval to linear, about 2–10 mm. long, though usually completely losing individuality by lateral and terminal fusing and thus occupying more or less of the leaf, lead-colored, permanently covered by epidermis and completely filling the space between its layers; spores dark-brown, rather firmly agglutinated, polyhedral (occasionally subspherical) to more irregular or elongate, smooth, chiefly 8–14  $\mu$ , the most elongate rarely 16  $\mu$ , in length.



## ON POACEAE:

*Alopecurus geniculatus*, Texas.*Panicum proliferum*, Illinois.*Panicum* sp., Illinois.TYPE LOCALITY: Tubarão, Brazil, on *Panicum* sp.

DISTRIBUTION: Illinois and Texas; also in South America.

EXSICCATI: Szym. &amp; Earle, Econ. Fungi C 32, C 33.

5. *Entyloma caricinum* Rostr. Medd. Grønland 3: 532. 1888.

Sori in leaves, oblong, gregarious, 1-2 mm. in length, black; spores brown-black, rather firmly coalescing, variable, angular, smooth, 15-22  $\mu$  in length.

## ON CYPERACEAE:

*Carex rigida*, Greenland.TYPE LOCALITY: Greenland, on *Carex rigida*.

DISTRIBUTION: Known only from the type locality.

6. *Entyloma Thalictri* Schröt. Krypt. Fl. Schles. 3<sup>1</sup>: 282. 1887.<sup>1</sup>*Entyloma Ranunculi* f. *Thalictri* Farl. Bot. Gaz. 8: 275. 1883.

Sori in leaves, forming small angular yellowish or reddish areas, about 1-2 mm. or by confluence more extended, often rather indefinite; spores often not very abundant, hyaline to yellowish, ovoid to subspherical or occasionally somewhat angled and more irregular, thin-walled to medium thick-walled, smooth, small, about 8-13  $\mu$  in length; conidia apparently hypophyllous.

## ON RANUNCULACEAE:

*Thalictrum dioicum*, Wisconsin.*Thalictrum polygamum*, Connecticut.*Thalictrum purpurascens*, Illinois.TYPE LOCALITY: Silesia, on *Thalictrum minus sylvaticum*.

DISTRIBUTION: Connecticut, Wisconsin, and Illinois; also in Europe.

EXSICCATI: Rab.-Wint. Fungi Eur. 3406; Roum. Fungi Gall. 3961; Ellis, N. Am. Fungi 1489; Szym. &amp; Earle, Econ. Fungi C 34, C 112.

7. *Entyloma Ranunculi* (Bon.) Schröt. Beitr. Biol. Pfl. 2: 370. 1877.*Fusidium Ranunculi* Bon. Handb. Myk. 43. 1851.*Entyloma Ficariae* Fisch. de Waldh. Bull. Soc. Nat. Mosc. 52<sup>1</sup>: 309. 1877. (Type from Germany, on *Ranunculus Ficaria*.)

Sori in leaves, forming thin subcircular or angular reddish-yellow spots on upper side but more conspicuous beneath by the whitish growth of conidia (rarely epiphyllous), about 1-6 mm. in length; spores yellowish-tinted when young but often reddish-yellow with age, chiefly subspherical or spherical, though occasionally more elongate or irregular, thick-walled, epispore usually evident and sometimes wrinkled or loosely investing endospore, 11-16  $\mu$  in length; conidia apparently of two types, either long-fusiform, often curved, 35-45  $\mu \times 2.5-3 \mu$ , or short-fusiform, often curved near tip, 15-20  $\mu \times 2.5-3.5 \mu$ , usually disappearing through germination.

## ON RANUNCULACEAE:

*Anemone quinquefolia* (*A. nemorosa*), Wisconsin.*Ranunculus eremogenes*, Washington.*Ranunculus pennsylvanicus*, Wisconsin.TYPE LOCALITY: Europe, on *Ranunculus Ficaria* (*Ficaria Ficaria*).

DISTRIBUTION: Wisconsin and Washington; also in Europe.

ILLUSTRATION: Phil. Trans. Roy. Soc. Lond. 178: 173.

8. *Entyloma Menispermii* Farl. & Trel. Bot. Gaz. 8: 275. 1883.

Sori in leaves, small, angular, limited by veins, scattered or often abundant and somewhat confluent, showing above as reddish-brown discolorations and beneath as more evident whitish areas often with a dense conidial outgrowth; spores hyaline to yellowish, chiefly subspherical or spherical, thin-walled, smooth, 8-12  $\mu$  in diameter; conidia (with mycelial outgrowth) forming a conspicuous hypophyllous mat, subclavate or fusoid, often adhering in pairs, 12-24  $\mu \times 3-5 \mu$ .

## ON MENISPERMACEAE:

*Menispermum canadense*, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Wisconsin.<sup>1</sup> Listed by Schröter in Jahresb. Schles. Ges. 60: 178. 1883.

TYPE LOCALITY: Madison, Wisconsin, on *Menispermum canadense*.  
 DISTRIBUTION: Illinois and Wisconsin to Kansas and North Dakota.  
 EXSICCATI: Ellis, N. Am. Fungi 1490; Underw. & Cook, Illustr. Fungi 59; Ellis & Ev. Fungi Columb. 1066; Rab.-Wint. Fungi Eur. 3002; Seym. & Earle, Econ. Fungi 201, C 23, C 24.

### 9. *Entyloma compositarum* Farl. Bot. Gaz. 8: 275. 1883.

Sori in leaves, small, angular, about 1–2 mm. in length, usually abundant and more or less confluent, forming spots whitish or yellowish on the under side and darker often purplish on the upper; spores chiefly hyaline, ovoid to spherical or occasionally polyhedral, smooth, thin-walled, chiefly 9–14  $\mu$  in length; usually with evident hypophyllous outgrowth of conidia which are fusiform or slightly clavate, often curved, about 15–20  $\mu \times 2$ –3  $\mu$ .

ON AMBROSIACEAE:

*Ambrosia artemisiaefolia*, Maine, Massachusetts.  
*Ambrosia psilostachya*, Kansas, Wisconsin.  
*Ambrosia trifida*, District of Columbia, Illinois, Missouri, Wisconsin.  
*Ambrosia* sp., Minnesota, Ohio.

ON CARDUACEAE:

*Aster cordifolius*, Massachusetts.  
*Aster Novi-Belgii*, Maine, Massachusetts.  
*Aster paniculatus*, Wisconsin.  
*Aster puniceus*, Massachusetts, New Hampshire, Wisconsin.  
*Aster* sp., Delaware; New Brunswick.  
*Bidens laevis* (*B. chrysanthemoides*), Kansas.  
*Erigeron elatus*, Washington.  
*Erigeron philadelphicus*, North Dakota, Wisconsin.  
*Erigeron salsuginosus*, Washington.  
*Eupatorium ageratoides*, Illinois, Iowa.  
*Gnaphalium* sp., Alabama.  
*Helenium autumnale*, Wisconsin.  
*Heterotheca subaxillaris* (*H. Lamarckii*), Kansas.  
*Ratibida pinnata* (*Lepachys pinnata*), Illinois, Iowa, Michigan, Minnesota, Wisconsin.  
*Rudbeckia laciniata*, Missouri, Ohio.  
*Senecio aureus*, Nebraska, Wisconsin.  
*Senecio Balsamitae* (*S. aureus Balsamitae*), Kansas.  
*Silphium integrifolium*, Wisconsin.

ON CICHORIACEAE:

*Lactuca canadensis*, Minnesota.

TYPE LOCALITY: New England, on *Aster puniceus*.

DISTRIBUTION: New Brunswick to Alabama and Washington.

ILLUSTRATION: Bot. Gaz. 19: pl. 18, f. 8.

EXSICCATI: Ellis & Ev. N. Am. Fungi 1492a, 2429a, 2429b; Seym. & Earle, Econ. Fungi C 16, C 17, C 18.

### 10. *Entyloma polysporum* (Peck) Farl. Bot. Gaz. 8: 275. 1883.

*Protomyces polysporus* Peck; Thüm. Myc. Univ. 1813. 1881.

Sori in leaves, forming subcircular to more irregular and often indefinite areas, generally dark-brown, 2–5 mm., usually limited in number and killing more or less of the surrounding tissue; spores hyaline to yellowish or even light chestnut-brown, ovoid to spherical or somewhat polyhedral, smooth, usually with remains of the gelatinous hypha forming outer coat of the thick wall, 12–17  $\mu$  or in some cases even 20  $\mu$  in length; evidence of conidia usually lacking.

ON AMBROSIACEAE:

*Ambrosia artemisiaefolia*, Connecticut, Illinois, Indiana, Iowa, Michigan, New York, Wisconsin.  
*Ambrosia bidentata*, Illinois.  
*Ambrosia trifida*, Illinois, Iowa, New York.

ON CARDUACEAE:

*Gaillardia pulchella*, Kansas.  
*Helianthus annuus*, Montana.

TYPE LOCALITY: Albany, New York, on *Ambrosia trifida*.

DISTRIBUTION: Connecticut to Montana and Kansas.

EXSICCATI: Ellis, N. Am. Fungi 1492b; Seym. & Earle, Econ. Fungi 292a–b, C 31; Ellis & Ev. Fungi Columb. 541; Roum. Fungi Sel. 4868; Thüm. Myc. Univ. 1813.

### 11. *Entyloma Holwayi* Sydow, Ust. 282. 1901.

Sori in leaves, forming subcircular or angular spots showing through on both surfaces, at first yellowish but finally reddish-brown, distinct or rarely subconfluent, 2–6 mm. in diameter; spores hyaline to evidently tinted reddish-brown, ovoid to chiefly subspherical,



smooth, with evident double walls, the outer usually irregularly thickened, 12–15  $\mu$  or even 17  $\mu$  in length; conidia not observed.

ON CARDUACEAE:

*Cosmos sulphureus*, Mexico.

TYPE LOCALITY: Chapala, Mexico, on *Cosmos sulphureus*.

DISTRIBUTION: Known only from the type locality.

EXSICCATI: Sydow, Ust. 282; Seym. & Earle, Econ. Fungi C 108.

12. **Entyloma arnicale** Ellis & Ev. (N. Am. Fungi 3136; hyponym. 1894)  
Bull. Torrey Club 22: 57. 1895.

*Ramularia arnicalis* Ellis & Ev. Proc. Acad. Nat. Sci. Phila. 1891: 85. 1891.

Sori in leaves, forming reddish-brown subcircular or angular areas, prominent on upper surface, 3–8 mm. in diameter, distinct or often killing intervening tissue and thus forming an extended dead area; spores yellowish to chestnut-brown, rather uniform, chiefly subspherical or spherical, often with evidence of gelatinous envelope which in some cases forms conspicuous papillae on the rather thick spore-wall, chiefly 13–17  $\mu$  in diameter; conidia forming a slight hypophyllous growth in center of area, chiefly linear-lanceolate, often slightly curved at upper end, about 18–28  $\mu \times 3 \mu$ .

ON CARDUACEAE:

*Arnica Chamissonis*, Washington.

*Arnica cordifolia*, Idaho.

*Arnica latifolia*, Washington.

TYPE LOCALITY: Mountains of Skamania County, Washington, on *Arnica Chamissonis*.

DISTRIBUTION: Idaho and Washington.

EXSICCATI: Ellis & Ev. N. Am. Fungi 3136; Ellis & Ev. Fungi Columb. 540.

13. **Entyloma guaraniticum** Speg. Anal. Soc. Ci. Argent. 17: 127. 1884.

Sori in leaves, subcircular, lightish or eventually dark-colored, usually separate, often thickened and concavo-convex, 2–6 mm. in diameter; spores hyaline to light-yellow, more or less adhering in masses or uniserial rows, subspherical to oblong or more irregular, provided with a prominent gelatinous envelope which is not always distinct from the cell-wall, 11–20  $\mu$  in length.

ON CARDUACEAE:

? *Bidens frondosa*, Massachusetts.

*Bidens leucantha*, Florida; Porto Rico.

TYPE LOCALITY: Paraguay, on *Bidens leucantha*.

DISTRIBUTION: Massachusetts and Florida; Porto Rico; also in South America.

EXSICCATI: Seym. & Earle, Econ. Fungi C 107.

14. **Entyloma Floerkeae** Holway; (Ellis & Ev. N. Am. Fungi 2288;  
hyponym. 1889) Davis, Trans. Wisc. Acad. 11: 170. 1897.

Sori in leaves, yellowish, often killing tissues, showing on both sides, oval to circular, about 2–4 mm. in length; spores hyaline to reddish-yellow, ovoid to chiefly subspherical or spherical, with moderately thin wall, often with remains of hypha showing as a short appendix, smooth, 9–13  $\mu$  in length; conidia hypophyllous, not forming a very prominent growth, slightly falcate, 12–16  $\mu \times 1.5 \mu$ .

ON LIMNANTHACEAE:

*Floerkea proserpinacoides*, Illinois, Ohio, Wisconsin.

TYPE LOCALITY: Racine, Wisconsin, on *Floerkea proserpinacoides*.

DISTRIBUTION: Ohio, Illinois, and Wisconsin.

EXSICCATI: Ellis & Ev. N. Am. Fungi 2288, 3237; Seym. & Earle, Econ. Fungi C 106.

15. **Entyloma Collinsiae** Hark. Bull. Calif. Acad. Sci. 1: 40. 1884.

Sori in leaves, whitish, showing on both surfaces, but somewhat darker-colored above, subcircular, thin, 1–3 mm. in diameter; spores tinted reddish-yellow, ovoid to chiefly subspherical or spherical, thick-walled, often with remnant of hypha showing as a short pedicel, 10–14  $\mu$  in length; conidia not observed.

ON SCROPHULARIACEAE:

*Collinsia bartsiaefolia*, California.

TYPE LOCALITY: Mt. Tamalpais, California, on *Collinsia bartsiaefolia*.

DISTRIBUTION: Known only from the type locality.

16. *Entyloma Lobeliae* Farl. Bot. Gaz. '8 : 275. 1883.

Sori in leaves, forming thin yellowish areas, whitish beneath, 1-10 mm. in diameter; spores hyaline to yellowish, oblong to subspherical, more or less angled, rather thick-walled, chiefly 9-12  $\mu$ , rarely 15  $\mu$ , in length; conidia hypophyllous, narrowly fusiform, 10-25  $\mu \times 2-3 \mu$ .

ON LOBELIACEAE:

*Lobelia inflata*, Connecticut, Illinois, Maine, Massachusetts, Missouri, New Hampshire, North Carolina, Ohio, Wisconsin.

*Lobelia* sp., Porto Rico.

TYPE LOCALITY: Gilead, Maine, on *Lobelia inflata*.

DISTRIBUTION: New England to Wisconsin, Missouri, and North Carolina; Porto Rico.

ILLUSTRATION: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 17, 31.

EXSICCATI: Rab.-Wint. Fungi Eur. 3302; Ellis, N. Am. Fungi 1493; Seym. & Earle, Econ. Fungi 326, C 22, C 110.

17. *Entyloma australe* Speg. Anal. Soc. Ci. Argent. 10: 5. J1 1880.

*Protomyces Physalidis* Kalchb. & Cooke, Grevillea 9: 22. S 1880.

*Entyloma Besseyi* Farl. Bot. Gaz. 8: 275. 1883. (Type from Iowa, on *Physalis* sp.)

*Entyloma Physalidis* Wint. Hedwigia 22: 130. 1883. (Type from South Africa, on *Physalis Hornemanni*.)

Sori in leaves, forming thin at first light-yellow but later darker-colored roundish or angular areas, usually 0.5-6 mm. in length; spores light- to reddish-yellow, ovoid to spherical or slightly angled, usually with apparently thick wall, chiefly 10-16  $\mu$  in length; conidia forming whitish epi- or hypophyllous growths, linear, somewhat curved, usually 30-55  $\mu \times 1-2 \mu$ .

ON SOLANACEAE:

*Physalis angulata*, Mississippi.

*Physalis heterophylla*, Iowa.

*Physalis lanceolata*, Illinois, Iowa, Kansas, Ohio, South Dakota.

*Physalis longifolia* (*P. lanceolata laevigata*), Kansas.

*Physalis philadelphica*, Indiana, Iowa.

*Physalis pubescens*, Connecticut, Illinois, Indiana, Kansas, Texas, Wisconsin.

*Physalis virginiana*, Connecticut, Delaware, Illinois, Iowa, Massachusetts, Michigan,

New Jersey, New York, Pennsylvania, Wisconsin; Canada.

*Physalis* sp., Connecticut, Iowa, Kansas, Kentucky, Minnesota, Nebraska, New York, Texas, Wisconsin; Porto Rico.

*Solanum nigrum*, Iowa, Kansas.

*Solanum triflorum*, North Dakota.

*Solanum* sp., Florida.

TYPE LOCALITY: Argentina, on *Physalis hirsuta*.

DISTRIBUTION: New England to North Dakota, Florida, and Texas; Canada; Porto Rico; also in South America and Africa.

ILLUSTRATION: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 34.

EXSICCATI: Kellerm. & Swingle, Kan. Fungi 38a, 38b; Ellis & Ev. Fungi Columb. 43, 1532; Seym. & Earle, Econ. Fungi 341, C 29, C 30, C 111; Ellis, N. Am. Fungi 1491a-b; Rab.-Wint. Fungi Eur. 3405.

18. *Entyloma serotinum* Schröt. Beitr. Biol. Pfl. 2: 437. 1877.

*Entyloma leuto-maculans* Hume, Proc. Iowa Acad. Sci. 9: 238. 1902. (Type from Iowa, on *Mertensia virginica*.)

Sori in leaves, subcircular, about 2-5 mm. in diameter, thin, light-colored, sometimes with slightly darker border, usually showing on both surfaces though more plainly below; spores hyaline to light reddish-yellow, ovoid to chiefly subspherical or spherical, occasionally slightly angled, with medium thick wall, smooth, 11-15  $\mu$  in length; conidia not observed.

ON BORAGINACEAE:

*Mertensia virginica*, Iowa, Maryland.

TYPE LOCALITY: Rastatt, Germany, on *Symphylum officinale*.

DISTRIBUTION: Maryland and Iowa; also in Europe.

ILLUSTRATION: E. & P. Nat. Pfl. 1<sup>st</sup>\*\* : 17, f. 10A.

19. *Entyloma Saniculae* Peck, Ann. Rep. N. Y. State Mus.

38: 100. 1885.

Sori in leaves, forming small whitish to reddish-brown usually angular areas, limited by the veins, about 0.5-2 mm., showing on both surfaces but more plainly below, often with



slight border on upper surface; spores light to reddish-yellow, ovoid to chiefly subspherical or spherical, thick-walled, smooth,  $11-16\ \mu$  in length; conidia chiefly hypophyllous, often in dense white tufts, filiform, tapering, often curved, about  $30-45\ \mu \times 1.5\ \mu$ .

ON AMMIACEAE:

*Sanicula marylandica*, Illinois, Iowa, New York, Wisconsin.

*Sanicula Menziesii*, California.

*Sanicula* sp., Alabama, Indiana.

TYPE LOCALITY: North Greenbush, New York, on *Sanicula marylandica*.

DISTRIBUTION: New York to Wisconsin and Alabama; California.

ILLUSTRATION: Ann. Rep. N. Y. State Mus. 38: pl. 1, f. 7-9.

## 20. *Entyloma Eryngii* (Corda) DeBary, Bot. Zeit. 32: 105. 1874.

*Physoderma Eryngii* Corda, Ic. Fung. 3: 3. 1839.

*Protomyces Eryngii* Fuckel, Symb. Myc. 75. 1869.

Sori in leaves, varying somewhat with the host, small, polygonal, or more elongate, often confluent, at first yellowish but eventually light reddish-brown, showing on both surfaces; spores light- to reddish-yellow, ovoid to subspherical or often polyhedral or more irregular through pressure, thick-walled, smooth, usually  $11-17\ \mu$  in length; conidia unknown.

ON AMMIACEAE:

*Eryngium aquaticum* (*E. yuccaefolium*), Iowa.

TYPE LOCALITY: Prague, Austro-Hungary, on *Eryngium campestre*.

DISTRIBUTION: Iowa; also in Europe.

ILLUSTRATIONS: Corda, Ic. Fung. 3: pl. 1, f. 8; Bot. Zeit. 32: pl. 2, f. 23, 24.

## 21. *Entyloma Linariae* Schröt. Beitr. Biol. Pfl. 2: 371. 1877.

Sori in leaves, forming hypophyllous yellowish more or less defined spots, scattered or somewhat confluent, thin, oval to circular, about 0.5-2 mm. in length; spores hyaline to yellowish, chiefly subspherical or spherical, smooth, with evident double wall,  $11-15\ \mu$  in length; conidia apparently lacking.

ON SCROPHULARIACEAE:

*Linaria Linaria* (*L. vulgaris*), Connecticut, New Jersey.

TYPE LOCALITY: Liegnitz, Germany, on *Linaria vulgaris*.

DISTRIBUTION: Connecticut and New Jersey; also in Europe.

ILLUSTRATION: Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 30.

EXSICCATI: Ellis & Ev. N. Am. Fungi 2428; Seym. & Earle, Econ. Fungi C 109.

*Entyloma Linariae Veronicae* Wint.; Rab.-Wint. Fungi Eur. 3001. 1884. *Entyloma Veronicae* Lagerh.; Pat. & Lagerh. Bull. Soc. Myc. Fr. 7: 170. 1891. Sori usually showing on both surfaces and thus more evident than with the species; spores often deeper-tinted and larger,  $13-16\ \mu$ , or the most elongate sometimes  $19\ \mu$ , in length; conidia described as  $27-30\ \mu \times 2\ \mu$ . ON SCROPHULARIACEAE: *Veronica americana*, Colorado, New York. *Veronica peregrina*, Connecticut, Illinois, Iowa, Maryland, Missouri, Wisconsin. DISTRIBUTION: Connecticut to Wisconsin, Maryland, and Colorado; also in South America. EXSICCATI: Ellis, N. Am. Fungi 1487; Rab.-Wint. Fungi Eur. 3001; Seym. & Earle, Econ. Fungi C 20.

## 22. *Entyloma Ellisii* Halsted, Bull. Torrey Club 17: 95. 1890.

Sori in leaves, forming pale white spots, indefinitely limited, subconfluent; spores hyaline or slightly yellowish-tinted, clustered in the intercellular spaces beneath the stomata, spherical, thick-walled ( $2-5\ \mu$ ), chiefly  $16-20\ \mu$  but varying from 11 to  $25\ \mu$  in diameter; conidia hypophyllous, abundant, acicular, small,  $10-14\ \mu$  by less than  $1\ \mu$ .

ON CHENOPODIACEAE:

*Spinacia oleracea*, New Jersey.

TYPE LOCALITY: In hot-beds, Newark, New Jersey, on *Spinacia oleracea*.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATION: Bull. New Jersey Agr. Exp. Sta. 70: f. 14-16.

## 23. *Entyloma Eschscholtziae* Hark. Bull. Calif. Acad. Sci. 1: 40. 1884.

Sori in leaves, forming whitish subcircular areas, usually with reddish-purple border or discoloration on the upper side, about 1 mm. in diameter; spores hyaline to reddish-yellow, somewhat ovoid or subspherical but chiefly of more or less irregular polyhedral form through pressure, adhering together rather firmly, with evidence of gelatinous sheath, smooth,  $10-15\ \mu$  in length; conidia not observed.

ON PAPAVERACEAE:

*Dendromecon* sp., California.

*Eschscholtzia californica*, California.  
 TYPE LOCALITY: San Francisco, California, on *Eschscholtzia californica*.  
 DISTRIBUTION: California.

24. *Entyloma fuscum* Schröt. Beitr. Biol. Pfl. 2: 373. 1877.

*Entyloma fuscum* Schröt.; Rab. Fungi Eur. 2495. 1878.  
*Entyloma bicolor* Zopf; Rab. Fungi Eur. 2496. 1878.

Sori in leaves, forming discolored somewhat irregular areas usually limited by the veins, about 2–6 mm. or by confluence much more extended, often with conspicuous white hypophyllous outgrowths; spores when fully matured light-yellow to chestnut-brown, ovoid to subspherical or occasionally somewhat angled, provided (especially when young) with a conspicuously swollen gelatinous envelope, smooth, chiefly 13–19  $\mu$  in length; the hypophyllous matted outgrowths usually showing few conidia which are described as fusiform, single-celled or septate, 10–22  $\mu \times 3 \mu$ .

ON PAPAVERACEAE:

*Papaver* sp. (cult.), Maine; New Brunswick.

TYPE LOCALITY: Germany (Rastatt, apparently), on *Papaver Argemone*.

DISTRIBUTION: Maine and New Brunswick; also in Europe.

EXSICCATI: Seym. & Earle, Econ. Fungi C 19.

25. *Entyloma microsporum* (Ung.) Schröt.; Rab. Fungi Eur. 1872. 1874.

*Protomyces microsporus* Ung. Exanth. Pfl. 343. 1833.  
*Entyloma Ungerianum* DeBary, Bot. Zeit. 32: 105. 1874.

Sori in leaves, forming hard fusoid to hemispherical pustules, often concavo-convex, 2–5 mm. in length, usually distinct, whitish or eventually reddish-brown; spores hyaline or slightly tinted, oblong or ovoid to subspherical or polyhedral, with a very thick usually irregular episporium which is often somewhat crenate, 12–22  $\mu$  in length; conidia not known.

ON RANUNCULACEAE:

*Ranunculus fascicularis*, Wisconsin.

*Ranunculus septentrionalis*, Illinois, Iowa, Wisconsin.

*Ranunculus* sp., Iowa.

TYPE LOCALITY: Europe, on *Ranunculus repens*.

DISTRIBUTION: Illinois, Iowa, and Wisconsin; also in Europe.

ILLUSTRATION: Bot. Zeit. 32: pl. 2, f. 1–13.

EXSICCATI: Ellis & Ev. Fungi Columb. 542; Ellis, N. Am. Fungi 1488; Seym. & Earle, Econ. Fungi C 25, C 26.

*Entyloma microsporum pygmaeum* Allesch. Bibl. Bot. 8: 40. 1897. Sori in leaves; spores hyaline to yellowish, irregular, oblong, spherical, frequently polyhedral, with large oil-drops, variable in size, 12–18  $\mu$  in length. ON RANUNCULACEAE: *Ranunculus pygmaeus*, Greenland.

26. *Entyloma Nymphaeae* (D. D. Cunn.) Setch. Bot. Gaz. 19: 189. 1894.

*Rhamphospora Nymphaeae* D. D. Cunn. Sci. Mem. Med. Off. Army India 3: 32. 1888.  
*Entyloma Castaliae* Holway; Davis, Trans. Wisc. Acad. 11: 174. 1897. (Type from Wisconsin, on *Nymphaea reniformis*).

Sori in leaves, forming variable often very irregular areas, usually most prominent on under side, yellowish or with age reddish-brown, scattered or subconfluent; spores hyaline, ovoid to subspherical, usually apiculate and with remains of hypha as an appendix at the opposite end, smooth or under an immersion very minutely verruculose, 10–14  $\mu$  in length; conidia not observed but spores said to germinate *in situ*.

ON NYMPHAEACEAE:

*Castalia odorata* (*Nymphaea odorata*), Connecticut, Massachusetts, Ohio.

*Castalia tuberosa* (*Nymphaea reniformis*), Illinois, Iowa, Wisconsin.

*Castalia* (*Nymphaea*) sp., Iowa, New Jersey, Ohio.

*Nymphaea advena* (*Nuphar advena*), Connecticut, Illinois, Massachusetts, Wisconsin.

TYPE LOCALITY: Calcutta, India (Botanical Garden), on *Nymphaea stellata* (*Castalia stellata*).

DISTRIBUTION: New England to Wisconsin and Iowa; also in Europe and Asia.

ILLUSTRATIONS: Sci. Mem. Med. Off. Army India 3: pl. 1, 2; Bull. Conn. Geol. Nat. Hist. Surv. 5: f. 18, 33.

EXSICCATI: Sydow, Ust. 277; Ellis & Ev. Fungi Columb. 1487; Seym. & Earle, Econ. Fungi C 27, C 28.

DOUBTFUL SPECIES

*Entyloma Alsines* Halsted, Bull. Torrey Club 20: 252. 1893. On *Alsine media*. No spores found.



### 6. BURRILLIA Setch. Proc. Am. Acad. 26: 18. 1891.

Sori in various parts of the host, generally in the leaves, rather permanently imbedded in the tissues; spore-balls without a distinct cortex of sterile cells, conspicuous, composed entirely of fertile cells or with some sterile parenchymatous cells; spores hyaline or yellowish, rather firmly united, of medium size, similar to those of *Entyloma*; germination similar to that of *Entyloma*.

Type, *Burrillia pustulata* Setch.

Sori forming scarcely thickened spots in leaves.

Spore-balls small, 75–140  $\mu$ .

Spore-balls large, 160–250  $\mu$ .

Sori forming small hypophyllous blisters.

1. *B. decipiens*.
2. *B. Echinodori*.
3. *B. pustulata*.

#### 1. *Burrillia decipiens* (Wint.) Clinton, Jour. Myc. 8: 154. 1902.

*Doassansia decipiens* Wint. Jour. Myc. 1: 102. 1885.

Sori in leaves, forming yellowish circular areas, thin, with spore-balls showing as minute elevations; spore-balls situated chiefly in the palisade-layer, densely clustered, consisting of a firmly adhering mass of spores without a definite cortex though partially covered with remains of dark-brown thick-walled sterile threads, chiefly subspherical, 75–140  $\mu$  in diameter; spores pale, polyhedral or often more irregular, with moderately thick smooth walls, 8–12  $\mu$  in diameter.

ON MENYANTHACEAE:

*Limnanthemum lacunosum*, New Jersey.

TYPE LOCALITY: Green Pond, Morris County, New Jersey, on *Limnanthemum lacunosum*.

DISTRIBUTION: Known only from the type locality.

#### 2. *Burrillia Echinodori* Clinton, Jour. Myc. 8: 154. 1902.

Sori in leaves, forming irregular to subcircular areas, showing spore-balls as closely clustered very minute elevations on both surfaces; usually a single spore-ball occupying entire section of leaf between layers of the epidermis, more or less merged sidewise, often irregular but chiefly oblong to subspherical, without distinct cortex but composed of sterile cells and spores intermixed, chiefly 160–250  $\mu$  in length; sterile cells light reddish-brown with thinner walls than the spores and more irregular in shape and size; spores light-colored, chiefly ovoid to spherical, occasionally somewhat flattened, apparently thick-walled, 12–18  $\mu$  in length.

ON ALISMACEAE:

*Echinodorus cordifolius* (*E. rostratus*), California, Florida.

TYPE LOCALITY: Lower Matecumbe, Florida, on *Echinodorus rostratus* (*E. cordifolius*).

DISTRIBUTION: Florida and California.

#### 3. *Burrillia pustulata* Setch. Proc. Am. Acad. 26: 18. 1891.

*Doassansiopsis pustulata* Dietel, in E. & P. Nat. Pfl. 11\*\* : 22. 1897.

Sori in leaves, forming small hypophyllous blisters irregularly clustered or scattered over the surface and eventually rupturing, showing above as small more or less distinct yellowish or reddish-brown areas; spore-balls situated in the spongy parenchyma, consisting of several irregular layers of fertile cells within which is a central mass of parenchymatous cells with oily contents, ellipsoidal, large, 200–350  $\mu$  in length; spores rather firmly adhering, subspherical or polyhedral, rarely more irregular, chiefly 8–12  $\mu$  in diameter.

ON ALISMACEAE:

*Sagittaria latifolia* (*S. variabilis*), Illinois, Nebraska, Wisconsin.

TYPE LOCALITY: Dixon, Illinois, on *Sagittaria variabilis* (*S. latifolia*).

DISTRIBUTION: Illinois, Wisconsin, and Nebraska.

ILLUSTRATION: Ann. Bot. 6: pl. 2, f. 84.

EXSICCATI: Seym. & Earle, Econ. Fungi, C 1.

#### EXCLUDED SPECIES

*Burrillia globulifera* Davis, Bot. Gaz. 22: 414. 1896. (*Doassansiopsis globulifera* Dietel, in E. & P. Nat. Pfl. 11\*\* : 22. 1897.) On *Glyceria fluitans*. Sclerotium of some fungus.

## 7. DOASSANSIA Cornu, Ann. Sci. Nat. VI. 15 : 285. 1883.

*Setchellia* Magn. Ber. Deuts. Bot. Ges. 13 : 468. 1895.

*Doassansiopsis* Dietel, in E. & P. Nat. Pfl. 11\*\* : 21. 1897.

Sori in various parts of the host, usually in the leaves, rather permanently embedded in the tissues; spore-balls conspicuous, permanent, consisting of a distinct cortical layer and a central mass of fertile cells entirely filling the interior or with innermost spores supplanted by parenchymatous cells or hyphal threads; spores hyaline or yellowish, with smooth usually thin walls, of medium size; germination often *in situ*, by means of a short promycelium which gives rise to a terminal group of elongate sporidia and these often bearing secondary and even tertiary groups.

Type, *Sclerotium Alismatis* Nees.

EUDOASSANSIA. Spore-balls within the cortex consisting entirely of spores.

Sori forming scarcely thickened spots in leaves.

Cortical cells inconspicuous, 8–10 $\mu$ .

Cortical cells conspicuous, 10–20 $\mu$  in length.

Cortical cells oblong to cubical; spore-balls 100–160 $\mu$ .

Cortical cells ovate to subspherical; spore-balls 100–125 $\mu$ .

Cortical cells radially elongate, chiefly oblong; spore-balls 120–180 $\mu$ .

Sori forming opaque pustules in leaves.

DOASSANSIOPSIS. Spore-balls within the cortex consisting of one or more layers of spores and a central mass of parenchymatous cells.

Sori in ovaries.

Sori in leaves.

Sori not causing distortion of tissues.

Spore-balls subspherical or spherical, 100–160 $\mu$ .

Spore-balls ellipsoidal to spherical, 200–300 $\mu$ .

Sori causing conspicuous distortion of tissues.

PSEUDODOASSANSIA. Spore-balls within the cortex consisting of several layers of spores and a central mass of interwoven hyphae.

1. *D. Epilobii*.

2. *D. ranunculina*.

3. *D. Sagittariae*.

4. *D. Alismatis*.

5. *D. opaca*.

6. *D. occulta*.

7. *D. Martianoffiana*.

8. *D. intermedia*.

9. *D. deformans*.

10. *D. obscura*.

### 1. *Doassansia Epilobii* Farl. Bot. Gaz. 8 : 277. 1883.

Sori in leaves, thin, forming at first yellowish but later dark-brown spots in which the aggregated spore-balls show as minute darker-colored elevations; spore-balls situated in the spongy parenchymatous tissue, usually clustered, consisting of a rather indefinite cortex and a spore-mass entirely filling the interior, ellipsoidal to irregularly spherical, 120–220 $\mu$  in length; cortical cells dark-brown, irregularly polyhedral or flattened radially, with thick walls, small, 8–10 $\mu$  in length; spores light-brownish, broadly ellipsoidal to irregularly polyhedral or subspherical, with smooth moderately thick walls, chiefly 8–12 $\mu$  in length.

ON ONAGRACEAE:

*Epilobium alpinum*, New Hampshire.

TYPE LOCALITY: White Mountains (King's Ravine), New Hampshire, on *Epilobium alpinum*.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATION: Ann. Bot. 6 : pl. 2, f. 66.

EXSICCATI: Ellis, N. Am. Fungi 1486.

### 2. *Doassansia ranunculina* Davis, Bot. Gaz. 19 : 416. 1894.

Sori in leaves, thin, forming light-brown spots 2–4 mm. in diameter, with the spore-balls showing as numerous minute clustered papillae; spore-balls developed in both palisade-layer and spongy parenchyma, consisting entirely of fertile cells surrounded by a definite cortex, ovoid to spherical, about 100–160 $\mu$  in length; cortical cells reddish-brown, polyhedral or cubical to oblong, often irregular, thin-walled, moderately prominent, chiefly 10–18 $\mu$  in length; spores hyaline to yellowish, chiefly subspherical or polyhedral, with thin smooth walls, about 10–14 $\mu$  in diameter. •

ON RANUNCULACEAE:

*Ranunculus delphinifolius* (*R. multifidus*), Wisconsin.

TYPE LOCALITY: Racine, Wisconsin, on *Ranunculus multifidus* (*R. delphinifolius*).

DISTRIBUTION: Wisconsin.

EXSICCATI: Ellis & Ev. N. Am. Fungi 3238; Ellis & Ev. Fungi Columb. 1531; Sydow, Ust. 337.



3. *Doassansia Sagittariae* (Westend.) Fisch, Ber. Deuts. Bot.  
Ges. 2: 405. 1884.

*Uredo Sagittariae* Westend. Herb. Crypt. Belge 1177. 1857.

*Doassansia Sagittariae* f. *confluens* Davis, Trans. Wisc. Acad. 14: 92. 1903.

Sori in leaves, thin, showing as distinct or somewhat merged yellowish or reddish-brown areas in which the spore-balls form numerous very minute elevations; spore-balls situated in either palisade-layer or the spongy parenchyma, consisting of a distinct cortex with spore-mass entirely filling the interior, subspherical, about 100–125  $\mu$  in diameter; cortical cells light reddish-brown, ovate to subspherical or irregularly polyhedral, rather thin-walled, loosely adhering, prominent, 10–18  $\mu$  in length; spores loosely compacted, chiefly subspherical or polyhedral, with moderately thick smooth wall, chiefly 8–13  $\mu$  in diameter.

ON ALISMACEAE:

*Sagittaria arifolia*, Illinois.

*Sagittaria graminea*, Delaware, Illinois.

*Sagittaria latifolia* (*S. variabilis*), Kansas, Missouri, New York, Ohio, Wisconsin.

*Sagittaria rigida* (*S. heterophylla*), Wisconsin.

*Sagittaria* sp., Missouri, Vermont; Canada.

TYPE LOCALITY: Marbais, Belgium, on *Sagittaria sagittifolia*.

DISTRIBUTION: Vermont to Delaware, Wisconsin, and Kansas; Canada; also in South America and Europe.

ILLUSTRATIONS: Ann. Bot. 6: *pl. 2, f. 71*, Brefeld, Unters. Gesamt. Myk. 12: *pl. 12, f. 1–16*; Ber. Deuts. Bot. Ges. 2: *pl. 10*.

EXSICCATI: Seym. & Earle, Econ. Fungi C 14, C 15; Rab.-Wint. Fungi Eur. 2902a.

4. *Doassansia Alismatis* (Nees) Cornu, Ann. Sci. Nat.  
VI. 15: 285. 1883.

*Sclerotium Alismatis* Nees; Fries, Syst. Myc. 2: 257. 1822.

*Entyloma Alismacearum* Sacc. Michelia 2: 44. 1880. (Type from France, on *Alisma Plantago*.)

Sori in leaves, thin, forming at first yellowish but eventually reddish-brown spots, sub-circular or irregular, distinct (5–12 mm.) or irregularly confluent, with spore-balls showing as very minute chiefly epiphyllous elevations; spore-balls situated in both palisade-layer and spongy parenchyma, consisting of a very distinct cortex with spore-mass entirely filling the interior, chiefly spherical, 120–180  $\mu$  in diameter; cortical cells light-brown, usually radially elongate, rather uniform, prominent, 12–20  $\mu \times 4$ –10  $\mu$ ; spores light-colored, loosely packed together, ellipsoidal to spherical or polyhedral, with rather thick smooth walls, chiefly 8–11  $\mu$  in length.

ON ALISMACEAE:

*Alisma Plantago-aquatica* (*A. Plantago*), California, Iowa, Kansas, Minnesota, Missouri, Nebraska, New York, Washington, Wisconsin.

TYPE LOCALITY: Europe, on *Alisma natans*.

DISTRIBUTION: New York to Washington and California; also in Europe and Asia.

ILLUSTRATIONS: Ann. Sci. Nat. VI. 15: *pl. 16, f. 1–4*; Ann. Bot. 6: *pl. 1, f. 1, pl. 2, f. 68–70*; E. & P. Nat. Pfl. 11\*: 22. *f. 13A*; Brefeld, Unters. Gesamt. Myk. 11: *pl. 11, f. 16–19*.

EXSICCATI: Ellis, N. Am. Fungi 1485; Ellis & Ev. Fungi Columb. 476; Sydow, Ust. 186.

5. *Doassansia opaca* Setch. Proc. Am. Acad. 26: 15. 1891.

Sori in leaves, forming evident opaque subcircular pustules about 2–5 mm. in diameter and showing elevations on both surfaces of the leaf, more or less scattered in yellowish or reddish-brown usually widely discolored areas; spore-balls closely compacted in a single layer occupying most of the space between the two layers of epidermis, consisting of a very distinct cortex and a mass of fertile cells entirely filling the interior, oblong to subspherical or cubical, 200–300  $\mu$  in greatest length; cortical cells reddish-brown, oblong or sub-cubical, very prominent, about 14–27  $\mu$  in length; spores rather loosely compacted, chiefly subspherical, with smooth walls, 10–15  $\mu$  in diameter.

ON ALISMACEAE:

*Sagittaria latifolia* (*S. variabilis*), Connecticut, Delaware, Illinois, Massachusetts, New York, Rhode Island.

TYPE LOCALITY: Newton, Massachusetts, on *Sagittaria variabilis* (*S. latifolia*).

DISTRIBUTION: New England to Delaware and Illinois.



ILLUSTRATIONS: Ann. Bot. 6: *pl.* 2, *f.* 72-74; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f.* 19, 22, 29.  
EXSICCATI: Rab.-Wint.-Paz. Fungi Eur. 3802; Seym. & Earle, Econ. Fungi C 12, C 13.

6. *Doassansia occulta* (Hoffm.) Cornu; Farl. Trans. Ottawa Field  
Nat. Club 2: 129. 1884.

*Sclerotium occultum* Hoffm. Ic. Anal. Fung. 67. 1863.

*Doassansiopsis occulta* Dietel, in E. & P. Nat. Pfl. 11\*\* : 21. 1897.

Sori in ovaries, causing them to become considerably swollen, ovate, olive-green to reddish-brown; spore-balls situated in the endocarp, consisting of a distinct cortex within which is a single layer of fertile cells surrounding a central mass of parenchymatous cells, ellipsoidal to spherical, often irregular, 100-160  $\mu$  in length; cortical cells polyhedral or more elongate tangentially, 8-10  $\mu$  in length; spores adhering rather firmly, about 10-12  $\mu$  in length.

ON ZANNICHELLIACEAE:

*Potamogeton Nuttallii* (*P. pennsylvanicus*), Connecticut, New York.

*Potamogeton* sp., Illinois, Kansas.

TYPE LOCALITY: Germany, on *Potamogeton* sp.

DISTRIBUTION: Connecticut, New York, Illinois, and Kansas; also in Europe.

ILLUSTRATIONS: Hoffm. loc. cit. *pl.* 16 (3), *f.* 1-9; Ann. Bot. 6: *pl.* 1, *f.* 43-50, *pl.* 2, *f.* 79.

EXSICCATI: Rab.-Wint.-Paz. Fungi Eur. 3801.

*Doassansia occulta* Farlowii (Cornu) Setch. Proc. Am. Acad. 26: 17. 1891. *Doassansia Farlowii* Cornu, Ann. Sci. Nat. VI. 15: 287. 1883. Sori and spore-balls as in the species; cortical cells smaller; spores chiefly oblong, about 16  $\mu \times$  3-4  $\mu$ . ON ZANNICHELLIACEAE: *Potamogeton natans*, Canada. *Potamogeton Nuttallii* (*P. pennsylvanicus*), Vermont. *Potamogeton perfoliatus* Richardsonii (*P. perfoliatus lanceolatus*), Canada. *Potamogeton pusillus*, Canada. *Potamogeton Vaseyi*, Canada. ILLUSTRATIONS: Ann. Sci. Nat. VI. 15: *pl.* 16, *f.* 5, 6; Ann. Bot. 6: *pl.* 2, *f.* 78.

7. *Doassansia Martianoﬀiana* (Thüm.) Schröt. Krypt. Fl. Schles.  
3<sup>1</sup>: 287. 1887.

*Protomyces Martianoﬀianus* Thüm. Bull. Soc. Nat. Mosc. 53<sup>1</sup>: 207. 1878.

*Doassansiopsis Martianoﬀiana* Dietel, in E. & P. Nat. Pfl. 11\*\* : 21. 1897.

Sori in leaves, thin, forming at first yellowish but eventually reddish-brown discolorations, distinct as small circular spots or more usually merged into indefinite areas often covering greater surface of leaf; spore-balls situated in the spongy parenchyma, consisting of a distinct cortex surrounding a single layer of fertile cells within which is a central mass of parenchymatous cells, subspherical or spherical, 100-160  $\mu$  in diameter; cortical cells brown, small, irregularly polyhedral or tangentially elongate, about 8-11  $\mu$ ; spores slightly tinted, polyhedral or elongate radially, chiefly 10-16  $\mu$  in length.

ON ZANNICHELLIACEAE:

*Potamogeton natans*, Massachusetts.

*Potamogeton* sp., Connecticut, Illinois, New York, Washington, Wisconsin; Canada.

TYPE LOCALITY: Minusinsk, Siberia, on *Potamogeton natans*.

DISTRIBUTION: New England to Wisconsin and Illinois; Canada; also in Europe and Asia.

ILLUSTRATIONS: Ann. Bot. 6: *pl.* 2, *f.* 80; E. & P. Nat. Pfl. 11\*\* : 22, *f.* 13CD.

EXSICCATI: Ellis & Ev. N. Am. Fungi 3239; Ellis & Ev. Fungi Columb. 863; Seym. & Earle, Econ. Fungi C 9, C 10, C 11.

8. *Doassansia intermedia* Setch. Bot. Gaz. 19: 185. 1894.

*Doassansia affinis* Ellis & Dearness, Bull. Torrey Club 22: 364. 1895. (Type from Canada, on *Sagittaria variabilis*.)

Sori in leaves, forming light-yellow to brownish subcircular spots, 5-12 mm. in diameter, with spore-balls showing as minute hypophyllous pustules; spore-balls situated in the spongy parenchyma, consisting of a cortex surrounding several layers of spores and a central mass of parenchymatous cells, ellipsoidal to spherical, 200-300  $\mu$  in length; cortical cells with dark-brown moderately thick walls, chiefly subspherical, cubical, or polyhedral, occasionally more elongate, of medium size, 9-14  $\mu$  in length; parenchymatous cells thin-walled, empty, about the size of the spores or slightly larger; spores adhering rather firmly, ellipsoidal to chiefly spherical, chiefly 8-11  $\mu$  in length.

ON ALISMACEAE:

*Sagittaria latifolia* (*S. variabilis*), Iowa, Minnesota, New Hampshire, Wisconsin; Canada.

TYPE LOCALITY: Shelburne, New Hampshire, on *Sagittaria variabilis* (*S. latifolia*).



DISTRIBUTION : New Hampshire to Minnesota and Iowa ; Canada.

ILLUSTRATION : Bot. Gaz. 19 : *pl. 18, f. 1.*

EXSICCATI : Ellis & Ev. N. Am. Fungi 3341 ; Ellis & Ev. Fungi Columb. 862.

9. *Doassansia deformans* Setch. Proc. Am. Acad. 26 : 17. 1891.

*Doassansiopsis deformans* Dietel, in E. & P. Nat. Pfl. 11\*\* : 21. 1897.

Sori in various parts of the host, usually causing conspicuous distortions when in the petioles or midribs, sometimes even 2-3 cm. in width by 7-8 cm. in length ; spore-balls filling intercellular spaces, consisting of a cortical layer surrounding a single layer of fertile cells and a central mass of parenchymatous cells, spherical, 100-140  $\mu$  in diameter ; cortical cells polyhedral, occasionally slightly elongate tangentially, sometimes even triangular in cross-section, small, 4-6  $\mu$   $\times$  8-12  $\mu$  ; parenchymatous cells thin-walled, without contents, chiefly larger than the spores, sometimes even 22  $\mu$  in length ; spores ovoid to polyhedral, rather firmly united, with rather thin smooth walls, 8-12  $\mu$ , rarely 15  $\mu$ , in length.

ON ALISMACEAE :

*Sagittaria latifolia* (*S. variabilis*), Connecticut, Illinois, Massachusetts, Missouri, Rhode Island, South Dakota, Wisconsin ; Canada.

*Sagittaria* sp., Florida, Texas.

TYPE LOCALITY : Norwich, Connecticut, on *Sagittaria variabilis* (*S. latifolia*).

DISTRIBUTION : New England to South Dakota, Florida and Texas ; Canada.

ILLUSTRATION : Ann. Bot. 6 : *pl. 1, f. 51-58, pl. 2, f. 81.*

EXSICCATI : Ellis & Ev. N. Am. Fungi 2705 ; Ellis & Ev. Fungi Columb. 272 ; Rab.-Wint.-Paz. Fungi Eur. 4002 ; Seym. & Earle, Econ. Fungi C 8.

10. *Doassansia obscura* Setch. Proc. Am. Acad. 26 : 16. 1891.

Sori not evident, the spore-balls being produced in the interior of the basal parts of the petioles without special distortion or discoloration though evident upon rupture of the enclosing tissues ; spore-balls arranged in single rows in the air-chambers, consisting of a distinct cortex surrounding several irregular layers of spores and a central mass of indefinite fungous hyphae, oblong to subspherical, large, 150-300  $\mu$  in length ; cortical cells rather light-brown and thin-walled, ovoid to obovate or subcordate, conspicuous, 12-18  $\mu$   $\times$  8-12  $\mu$  ; spores light-brown, chiefly subspherical, with thin smooth walls, about 8-12  $\mu$  in diameter.

ON ALISMACEAE :

*Sagittaria latifolia* (*S. variabilis*), Connecticut, Massachusetts.

TYPE LOCALITY : Norwich, Connecticut, on *Sagittaria variabilis* (*S. latifolia*).

DISTRIBUTION : Massachusetts and Connecticut.

ILLUSTRATION : Ann. Bot. 6 : *pl. 1, f. 33-42, pl. 2, f. 75-77.*

EXCLUDED SPECIES

*Doassansia Sintenisii* Bres. Bot. Jahrb. 17 : 489. 1893. On *Cedrela odorata*. Probably insect work.

*Doassansia Zizaniae* Davis, Bot. Gaz. 26 : 353. 1898. On *Zizania aquatica*. Sclerotium of some fungus.

8. *TRACYA* Sydow, Hedwigia Beibl. 40 : 3. 1901.

*Cornuella* Setch. Proc. Am. Acad. 26 : 19. My 1891. Not *Cornuella* Pierre. Ja 1891.

Sori in the leaves (fronds), permanently imbedded in the tissues ; spore-balls conspicuous, without cortical layer, composed of a single layer of fertile cells enclosing a network of septate filaments ; spores hyaline to yellowish, firmly united, of small to medium size ; germination as in *Doassansia*.

Type, *Cornuella Lemnae* Setch.

1. *Tracya Lemnae* (Setch.) Sydow, Hedwigia Beibl. 40 : 3. 1901.

*Cornuella Lemnae* Setch. Proc. Am. Acad. 26 : 19. 1891.

Sori in the languishing fronds, rather indefinite, showing the spore-balls as very minute clustered or scattered opaque bodies ; spore-balls situated in the spongy parenchyma above the lower epidermis, consisting of a single layer of fertile cells within which is a loosely arranged network of brownish filaments, ellipsoidal to spherical, small, 50-100  $\mu$  in length ;

spores yellowish, originating from ends of the filaments, firmly compacted, cubical, polyhedral or often more elongate radially, chiefly 10-12  $\mu$  in length.

ON LEMNACEAE :

*Spirodela polyrhiza*, Connecticut, Massachusetts, Rhode Island, Wisconsin.

TYPE LOCALITY : Cambridge (Glacialis Pond), Massachusetts, on *Spirodela polyrhiza*.

DISTRIBUTION : New England and Wisconsin.

ILLUSTRATIONS : Ann. Bot. 6: *pl. 1, f. 59-64, pl. 2, f. 82-83*; Bull. Conn. Geol. Nat. Hist. Surv. 5: *f. 20*.

EXSICCATI : Seym. & Earle, Econ. Fungi C 55.



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